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Two body schedules are needed. The framing department is interested only in body types and quantities. Color and trim are specified later

# Automobile Production Control

**Today automobile buyers demand cars that are individual and distinctive. The manufacturer must therefore offer a highly diversified product, although in doing so his problems of assembly and distribution are made more complicated**

DEAN S. FIELDS

*Supervisor of Production Control Department, Graham-Paige Motor Corporation*

THE Graham-Paige Motors Corporation offers both a wide selection of model or chassis types and many options as to color, trim, and wheel equipment in all body types. A picture of our program showed that we were offering four chassis types, with a minimum of four body types on each chassis; from two to five color selections and three trim selections on each body type; four wheel options; transmissions equipped with or without free-wheeling units; and numerous other minor options such as axle gear ratios, tire sizes, and safety glass. All of this complexity of models and colors is run in one body plant and assembled on one assembly line.

To carry out this program of manufacture and distribution, a thorough job of production engineering had to be evolved. The aim and purpose of this study was to devise a system whereby:

1. The movements of all major assembly units throughout their respective departments were so con-

**The buyer's taste in color must be suited. A schedule posted in the paint shop indicates the lacquer to be used on each body**

trolled that they would finally merge into the completed car at the proper time and place.

2. It was desired that this result be obtained, without the necessity of carrying, in most cases, any inventory or bank of these units ahead of the final assembly line.

3. The completed car should be of such type and equipment as to apply against a definite shipping order.

In order to achieve these results, it was necessary to centralize all scheduling and dispatching of major units in one department, called the Production Control Department. This department schedules and synchronizes the movement of materials and assemblies through the following departments:

1. Body Plant
   (a) Body Framing (model and type)
   (b) Body Painting
   (c) Body Trimming
   (d) Body Shipping
2. Motor Department
   (a) Cylinder Block (model and type)
   (b) Drive (right or left)
   (c) Transmission Type
3. Sheet Metal Department
   (a) Sheet Metal Assembly and Polishing
   (b) Sheet Metal Enameling and Painting
4. Hood Painting
   (a) Type and Color
5. Final Car Assembly
   (a) Frame Assembly
   (b) Rear Axle Assembly
   (c) Front Axle Assembly
   (d) Chassis Painting
   (e) Wheel Painting
   (f) Wheel and Tire Assembly to Chassis
   (g) Steering Gear Assembly
   (h) Finished Sheet Metal Assembly
   (i) Body Wiring and Mounting on Chassis
   (j) Radiator Assembly
   (k) Hood Assembly

Having centralized the functions of scheduling in this one department, it next became necessary to adopt a system which would fully cover all the phases of production control desired. Having adopted such a system, it then became necessary thoroughly to outline and explain it to the foremen and the group or gang key men, upon whose efforts the successful operation of such a system depended.

The following outline was finally worked out and adopted:

1. For the sake of brevity and clarity of understanding a system of symbolizing bodies, motors, and chassis types was adopted. Thus, in scheduling bodies, instead of referring to a body as a "Standard Six Sedan Body," we simply refer to it by the body model number.

2. In making out our schedules, each item or items of assembly were assigned an order or lot number for checking purposes. These order numbers run from one to five hundred before starting over again, the object being that we would never have two orders of the same number in the system at the same time. The amount on an order might range from one upward, but no one order number could carry anything but like assemblies.

Thus, a foreman, upon receiving his schedule, starts his men to work upon the assemblies on the first order number of his schedule. Upon completion of that item, he then checks that order as complete and proceeds upon the second order.

It must be noted, however, that the successful merging of completed assemblies into the finished car depends upon the thoroughness of the key men at the central points of the individual assemblies. One item too many, or one too few, may cause confusion and loss of time in the final assembly. We trained our men thoroughly on this, gave each of them a list to refer to at all times of the various symbol numbers. We expect each foreman or key man to assume the responsibility of seeing that the work proceeds through his department exactly as scheduled.

3. A method of distributing these schedules to the various departments had to be worked out. To obtain the flexibility of immediate contact with all the departments affected, plus the safeguard of giving all schedules out at one writing, instead of several, we installed a Telautograph System. This is an electrical impulse writing machine, which enables us to write individually or collectively to all the departments heretofore enumerated, so that the schedule clerk, without leaving his desk, may send out all the schedules in a short space of time to the various departments affected.

Because of the differences of detail required, we found it necessary to make out three complete sets of master schedules, one for the body plant, one for the motor assembly, and the third for all other departments. Each of the first two finally dovetailed into the third, however, as we used information from them in making up our final car schedule.

### Starting with the Dealer

Havinig arrived at a method of distributing and checking our schedules, we had to arrive at a basis of making up these schedules. This, of course, came from the orders as received from our dealers. From the Sales Distribution Department, we receive a copy of all "Car Shipping Orders." This form shows the destination of the car or cars, the amount ordered, model, color, trim, and wheel equipment. These orders are tabulated each day as to the detail mentioned and added to a permanent inventory of live orders on hand under their separate classifications.

A permanent inventory of finished cars on hand is also kept. For this purpose, we receive a copy of the "Service Record Card" for each car, which shows all the detail as to model, color, trim, and wheel equipment. These are filed in a visible file by their separate model and equipment classifications until the car is shipped from our factory. By adding to our permanent inventory of finished cars on hand those already scheduled through our system, we arrive at a count of total cars of that type and equipment in our entire system. Comparing this amount with our permanent inventory of good or live orders on hand and subtracting differences, gives us the basis of our master schedules.

Certain orders cannot be controlled by this method because of colors or equipment not in our standard line. These we put through our system by means of travelers, specifying complete detail as to the color and equipment desired, together with the carload number and the dealer ordering same. This serves as identification not only in building, but also in shipping. All foreign shipment cars are put through on a traveler also, but we use a different colored traveler than on domestic cars, for ready identification.

The basis of scheduling arrived at, we then turned to the making out of our master schedules and their application in the various departments. First in the order of making out master schedules comes the body plant schedule, since the body is the unit of assembly taking the longest time to complete. By comparing our permanent order count against the permanent inventory of cars on hand and in the system, we see what body types and colors we need to schedule. In case this amount is greater than we can produce in a day's time, we prorate a day's schedule according to the number of orders we have on hand of each body type.

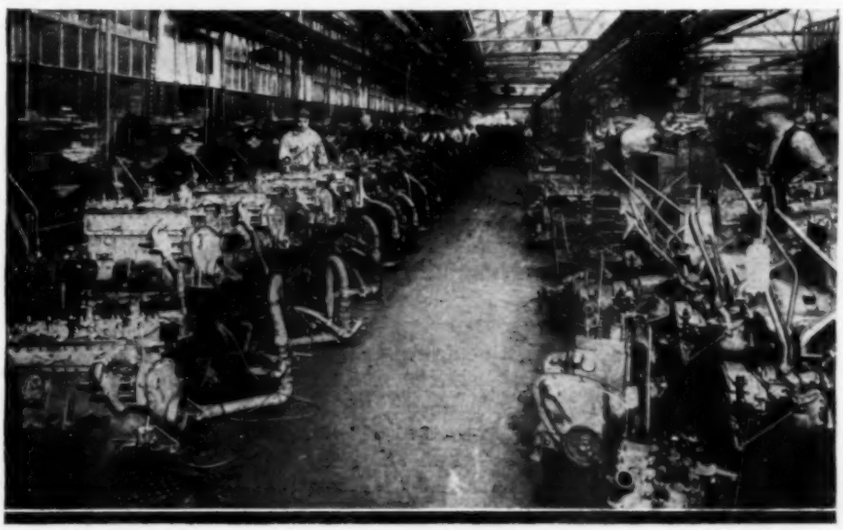
Because we have numerous body types running over the same line, but which are all framed and assembled on separate body jigs, we have to make out two body schedules. The first one is merely a framing schedule which is given to the sheet metal foreman in the body plant. This schedule shows the different body types and amounts of each which are to be assembled on that day. It does not specify anything as to color or trims nor the exact order in which the bodies are to be put into the assembly line. This is because the bodies come off at least a dozen different framing jigs, and to attempt to study out the exact order in which they would be framed would involve more detail than it was worth.

Upon receiving this framing schedule, the foreman so distributes his men among the different framing jigs that the average amount of each body type desired hourly will come off that jig ready to go on the assembly line. Immediately upon leaving the framing jig, they go on the assembly line and proceed through the door hanging, metal finishing and other operations performed before going into the paint shop.

### Making Up the Master Schedule

At the point where the body is cleaned, preparatory to applying the prime and surface costs, we make an exact list of the bodies, showing the order in which they are proceeding and the amounts of each body type in each group. This point for checking was selected because the body travels from here by continuous and unchanged conveyor movement. Using this information as a base, we then write up a master schedule for the remaining departments in the body plant. This schedule gives the following information:

1. Order number.
2. Amount of bodies on the order.
3. Body model number (this symbol used instead of writing out type in full).



**A number painted on the end of each cylinder block tells whether the motor is for right- or left-hand drive or whether it is to be used with or without free-wheeling**

4. Paint color desired.
5. Glass type desired.
6. Type of trim desired.

This information is then transmitted to the paint and trim shop and posted in their departments. As the bodies proceed through the initial or governing operation in each department, the key man at that point refers to this schedule for information as to the paint color or trim type desired. After each order of bodies passes his operation, he then checks off the order as completed and proceeds on the next order. This system of checking insures one hundred per cent accuracy in following out the detail of the schedule as written.

After leaving the trim shop, the bodies proceed through the lacquer, sanding, polishing, and striping operations, and upon final inspection okay, are sent to the loading dock. The order of shipping them from the body plant to the main assembly plant is also decided by the production control department. Further elaboration on this phase will be taken up in the discussion of scheduling the main assembly line.

Next in the order of scheduling comes the motor assembly department. In symbolizing our units in this department, we adopted a somewhat different method. Each type of motor is assigned a symbol number which is painted on the end of the cylinder block at the point where it enters the assembly department. This number conveyed to the key men throughout the department the type of motor that was desired. For instance, our system of numbering represented models as follows:

1. Standard 6 motor —
   Left-hand drive — Standard transmission
2. Standard 6 motor —
   Left-hand drive — Free-wheeling transmission
3. Standard 6 motor —
   Right-hand drive — Standard transmission
4. Standard 6 motor —
   Right-hand drive — Free-wheeling transmission.

It can readily be seen that the key men in the organization, by looking at the number on the cylinder block and referring to his list of symbol numbers, is in no doubt as to what units should be assembled into each motor.

Ahead of the final or car assembly, we carry a small bank of finished motors, ranging from two to five hours' supply, depending upon the rate of our production. This amount, plus the motors in the process of assembly, provides the total motors needed to take care of the final assembly line for about one and one-half days production, which is the minimum we have scheduled in this department.

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# Some Day—*Discussion*

E. H. FISH

ALLAH be praised, or words to that effect. Someone has read something I wrote. To be sure, I wrote it seventeen years ago and the patent has expired, and the man that read it lives the other side of the ocean, but it is something to remember or keep an article that long. All this refers to Donald Raeburn's article (*AM*—Vol. 75, page 623) entitled "Some Day."

Seriously, if I remember my article rightly I suggested that no one knew the one best way to turn a one-inch shaft two or three feet long. A short time after the article was published I went to work for a concern that makes grinding machinery and I learned that the way to machine such shafts is to grind them. Now Mr. Raeburn comes along with other specific problems which he says have so far proved unsolved. Very likely, the *American Machinist* has correspondents who have solved similar cases. If it did not sound like barefaced advertising I could mention one shop that appears to have solved this shaft problem.

At one time I designed a special lathe to do this work rapidly only to discover that by some simple means, the shop was turning these shafts on an ordinary lathe in about two-thirds of the best time I dared to guarantee with my special machine.

I suspect that almost all these problems have been solved, one in one place another in another, and similar problems have been solved at the opposite ends of the earth. All that is needed is to gather together and harmonize these experiences and then spend a few years experimenting and interpolating until finally all these methods can be made into one monumental work.

I have before now suggested, possibly in this same article, that this was something that engineering schools could well undertake. Let someone who has nothing else to do collect from the ends of the earth, and more especially from small shops, ways of doing simple things rapidly. Then let each of a hundred engineering schools undertake to have one student take one seemingly simple problem, like a small pulley, and experiment in the light of the experience of others, and write a thesis. Then throwing away the conclusions and assembling all the experimental data, let someone write a monumental and valuable essay on the subject of elementary machine shop procedure. He should begin fairly early in life or it may prove to be his monument.

All this is about the same thing as saying that we machinists know, even yet, very little about the fine art of doing machine work.

## • NEXT WEEK •

As we visit plant after plant we become more and more impressed with the versatility of standard machine tools in the hands of intelligent tool engineers and operators. The first article in next week's issue is an example of just such versatility; it concerns itself with a standard automatic screw machine and its tooling for special high-precision electrical parts. As nearly as we can judge, the author describes every essential detail, even to a special rack for holding the finished parts.

Still keeping our fingers crossed, because one can never tell about last-minute changes, we are planning also to publish next week: data on recent developments in plastic molding by the injection process; more concerning a valuable cutter-testing device; scheduling by graph; more on punching in the strip; the final installments of "Machine Swaging as a Modern Art" and "Automobile Production Control."

## • IN A. M. •

**Many variables enter into the design of even the simpler gear trains. When speeds, ratios, and loads are unusual, the problem of choosing the best of the many types of gearing, now available becomes complicated. The author supplies some helpful pointers for those who have just such problems to solve**

# Practical Considerations in Gear Selection

**W. H. HIMES**

*Manager of Engineering, Nuttall Works, Westinghouse Electric and Manufacturing Company*

VARIOUS formulas are commonly used to determine such gear characteristics as pitch, face, and material. But the more basic point of design—that of choosing the proper type of gearing—is a question of engineering judgment. At the outset, it is in order to classify requirements into three groups, as follows:

1. Parallel shaft gearing.
2. Gearing with shafts at right angles (intersecting).
3. Gearing with shafts at right angles but in different planes (non-intersecting).

All of the above types may now be purchased in units, in a great variety of ratios and power, but in what follows, only open type gearing is considered, as the various problems discussed are all taken care of by the manufacturer when a gear unit is applied.

Parallel shaft gearing should be considered on the basis of ratio. The extreme range that is suitable to handle in a single reduction is about 10 to 1, and there may be demands for any practical ratio other than this, even down to 1 to 1. Sometimes circumstances may modify the maximum ratio limitation. If the ratio requirement exceeds 8 or 12 to 1, it will be necessary to go to a double reduction, or two trains of gears. This will provide ratios as high as 100 to 1 in extreme cases (two 10 to 1 reductions), and in like manner, it is not unusual to resort to triple and even quadruple reductions. If space is available, it is generally cheaper to resort to a few reductions of high ratio, but if compactness is an important factor, several reductions of 8 to 1, or less, will be found to give better results. For instance, suppose a reduction of 1,000 to 1 were required. The high-speed shaft is to run at 1,750 r.p.m. At such a speed in the industrial range of horsepower, a pinion of 15 to 19 teeth would be considered good practice. Assume 16 teeth and a gear of 120 teeth giving a ratio of $7\frac{1}{2}$ to 1. In the next reduction, the pinion will have a much lower speed, and we may readily consider 12 or 13 teeth of the modern "super" tooth design. This pinion will be making only 233 r.p.m.

Combining this 12 tooth pinion with a 120 tooth gear, we have a ratio of 10 to 1 or a combined ratio of $10 \times 7\frac{1}{2}$ or 75 to 1. This leaves us $1{,}000 \div 75$, or 13.3 to 1, for the final reduction. The last pinion will be making only 23.3 r.p.m. and again resorting to the modern pinion design we can apply to a 9 tooth pinion with a 120 tooth gear. We then have three gears, with the same number of teeth, and pinions varying to suit the speed conditions.

Now comes the question of type of tooth. Should it be spur, single helical, or herringbone? Always apply the simplest type possible. If the speed is low and the noise restrictions are not severe, apply spur gearing; if speeds are too high for this type, use single helical

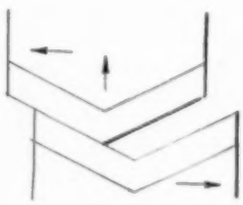


**Fig. 1 — Herringbone gears are not suitable for applications where the shaft has lateral movement or float. Half the face must take the full load, and undesirable speed fluctuations are set up**

or double helical (herringbone) as other conditions dictate. If the shafts to be connected are protected against end thrust, high-speed requirements are best satisfied by using single helical gears. If not, the double or opposed helical type will give quietness without developing end thrust. It should be borne in mind, however, in applying herringbone gears in open work that where the shafts have end float or travel independently of each other, the herringbone gear may be least suitable of all, regardless of speed. For illustration, suppose the application consists of heavy rolls, having longitudinal freedom and thus subject to independent float or drift. The force necessary to restrain this movement may be great in proportion to the torque involved. Connecting such rolls by herringbone gears would be a mistake. Two errors are involved. As the rolls move inde-

pendently, even the slightest amount, all load is carried by either one half or the other of the herringbone face, thus doubling the load first on one face and then on the other (see Fig. 1). Secondly, this lateral movement sets up relative rotational errors, alternately accelerating and decelerating each roll. This adds an incalculable amount to the normal gear load. The ideal gears for such an application are spurs. If the speed is too high for spurs, then separate shafts must be provided for the gearing, with couplings which will absorb the longitudinal motion. On these separate shafts, either helical or herringbone gears may be mounted.

### How Much Overlap?

Also, as a general rule, herringbone gears should not be applied where the pinion must be overhung as on a motor shaft. Either low-angle helicals or spurs are less likely to cause trouble because of deflection of the unsupported motor shaft.

There is a common feeling among gear men that the application of the helical principle is of no avail unless the angle is steep enough to attain an overlap of one circular pitch, or a "one tooth overlap," as it is generally referred to. In my opinion, this is not necessarily the case. It is true that the steeper the helix angle, the more effective is the silencing tendency, but there is no virtue in an exact overlap of one tooth as far as can be determined by tests. This has long been a controversial point, and while it is difficult to prove definitely either way, the burden of proof that there is any virtue in an exact overlap seems to be on the proponents of that system. For silencing effect, I would recommend as much overlap as can be attained with the width of face available without resorting to excessive helix angles.

A considerable excess normal pressure can be incurred by high helix angles, and this is undesirable. The critical condition, which determines the success or failure of a given gear set, is just this one item of normal pressure. Modern research has demonstrated, and practice has confirmed, that the stress in the gear tooth metal about the point of contact is much greater than that at the base of the tooth caused by bending load. This has become so well established with gear manufacturers that the actual breaking of a tooth is never regarded as a sign of overload, but rather of faulty heat-treatment—the tooth is regarded as too hard and brittle. Therefore the sign of overload is abrasion or pitting on the surface of the tooth. It may be argued that there must be fallacy in the above reasoning, because gears have been figured by the Lewis formula for year with satisfactory results. However, the bending stress as considered by the Lewis formula is proportional to the pressure applied at the surface and is therefore a crude measure of this critical stress.

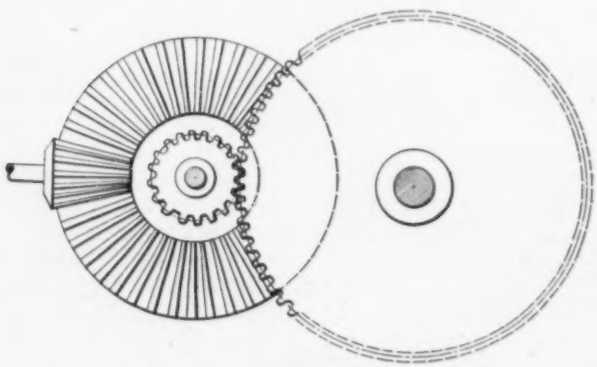


**Fig. 2—For right-angle drives in one plane, with ratios over 8 to 1, a two-stage reduction using bevels and spurs, or bevels and helical gears, may be employed. Helical gears can be selected to counterbalance partly the thrust of the bevels**

### Right Angle Drives

Now consider the second group of applications—right angle drives. For ratios of 1 to 1 up to 5 to 1, bevel drives of good proportion may be obtained with straight bevels. Somewhat higher ratios may be secured by means of spiral bevels. If the ratio is greater than 5 to 1, even up to 8 to 1, the use of a single reduction bevel set is preferable rather than to resort to the expense of a double reduction. For ratios over 8 to 1, it is generally desirable to double up, using one bevel set and one parallel shaft set. All that has been said in regard to securing larger ratios with parallel shafts may be applied to bevels, except that good design would bring down the ratio of the bevel set to somewhat less than the maximum used in the former type.

If there are facilities for cutting spiral bevels of the required size, it is better to use them for the high-speed set, and follow with spurs or helicals for the low-speed set. As to which of the latter is chosen would depend upon the speed of periphery as previously discussed, except for one consideration. The bevel set will always develop some thrust. Neither spurs nor double helicals do this, so it is desirable to match a single helical against the bevel gear to balance as far as possible this thrust tendency of the bevel. In the event that peripheral velocities are low, straight bevels may be used instead of spirals. Of course, in all types of bevel gears, there is a longitudinal thrust developed along both the gear and pinion shafts. This force is greater for the gear shaft. Bearings having thrust capacity must therefore be provided for each shaft of a bevel set.

### Non-Intersecting Shafts

Lining up the members of a bevel set is a much more complex problem than for any parallel shaft drive, and the manufacturer will supply special instructions. It is not practical to attempt to operate bevel gears of any but the lightest duty without means for longitudinal adjustment of both gear and pinion shafts.

It may frequently happen that the most convenient supplier is not in position to furnish spiral bevels, but can supply smooth running helicals, either single or double, suitable for high speed. In this event, it may be well worth while to reverse the rule previously stated, make the parallel shaft set the high-speed train, and use such straight bevels as may be procured, for the low-speed set. For any normal high-speed source, the first reduction should bring the speed of the seconadry shaft down to where the noise of straight bevels should not be objectionable.

For right-angle drives with non-intersecting shafts, two types of gearing are now available in both open and unit types. Worm drive units have been on the market for years in a wide variety of ratios and capacities, but during the last ten years, several firms have begun to offer right-angle double-reduction units in a variety of ratios and powers.

For the open application, also in this class, either a worm and gear of the necessary ratio and capacity can be used, or a double reduction combination can be de-

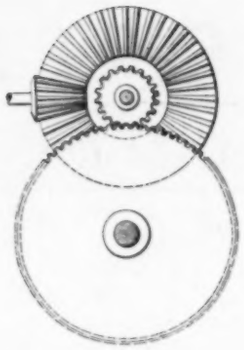


**Fig. 3—A choice must be made between worm gearing and a double reduction, using one pair of bevels, when the application is a right angle drive in two different planes**

signed similar to those discussed in the previous classification with the bevel gears so arranged that the pinion shaft is at right angles to the plane of the other shafts (see Fig. 3). Both of these types involve about the same difficulty of assembly. Both must be lined up carefully by a skilled specialist.

The double reduction has the drawback of requiring two pairs of gears, three shafts and six bearings, at least two of which must have thrust capacity. On the other hand, it may be installed with any ratio between 1 to 1 and 50 to 1 or thereabouts. There is no limit to its capacity range, and it may be made highly efficient at all ratios. It can be operated at slow speeds with simple guarding.

The worm drive needs only two shafts, but it is awkward to construct for very low ratios, say 2 to 1, and at 1 to 1, it practically loses its identity as a worm drive, and becomes a spiral gear set. It can readily be constructed for ratios of 50 to 1, or even 100 to 1, if efficiency is not important. In the event that efficiency is a consideration, a single-reduction worm drive will not be suitable at ratios exceeding 15 or 20 to 1. Where these ratios are exceeded, the efficiency will drop below 90 per cent, and it falls away rapidly as the ratio increases. The maximum power that can readily be transmitted by a worm drive is generally placed somewhere between 100 and 200 hp. The worm drive cannot be operated without an oil bath except for intermittent work. This type need not be totally inclosed for continuous duty, if it runs at such a low speed as not to throw off oil. In this case, the worm may be arranged so that the tips of the threads dip into a pan of oil of suitable viscosity.

When two helical gears are meshed together in such a way that the shafts are not parallel (that is, two helicals with, say, right-hand helices), we have another form of gearing to accomplish the purpose of Class 3, but these are not generally regarded with favor by experienced gear men. They have not been found reliable for any but light duty.

The author realizes that many points here treated may be regarded as controversial, especially where arbitrary limits as to ratios, efficiencies, and numbers of teeth have been quoted. No doubt, many readers will immediately think of exceptions to statements made here. However, to elucidate this subject to the uninitiated, some limits must be quoted. I have endeavored to make clear that while these limits give a general idea of the subject, they must not be regarded as fixed, like the number of dimes in a dollar, but variable to meet individual conditions, just as the number of pounds of meat that may be bought for a dollar depend upon the season, locality and quality. This article is expected to be a general guide to the man who has gear problems to solve and wants to draw his own conclusions about the best method of solving them.

# In Defense of the Machine

CYRIL J. BATH
*President, The Steelweld Machinery Co.*

BECAUSE there is great maladjustment in trade and much unemployment, it is distressing to notice how many people think that somehow machinery and mass production are to blame. Even people engaged in the manufacture of machinery look somewhat shamefaced.

Economists, who should know better, take nasty and thoughtless cracks at the machinery Frankenstein every so often. Considering, however, the variety of subjects on which our economic prophets have been consistently mistaken, this latter should occasion us no undue alarm.

As a matter of fact, unemployment and misery, bankruptcy and starvation, war, famine and plague, were more common to mankind before the machinery era, than they have been since. The wide margin of machine productivity has made a usual condition rare.

It is really extraordinary that any sane man, looking over the record of our applied scientific knowledge in recent years, should attribute unemployment to mechanical developments. The automobile is surely a case in point. Purely a mechanistic triumph, a child of mass production, what unemployment has it developed?

The payrolls of the motor car manufacturers are among the largest in the country. For every dollar spent for cars direct, other dollars have gone to labor for building roads, and others still for garage repairs and service stations, and the vast production of raw materials necessary. The ramifications of this business are stupendous. If fewer men are used to build cars, the lower cost spreads car usage more widely. Consequently there is greater consumption of all steel, rubber, glass, oil, gasoline, nickel and the vast assemblage of other laborers' work, which the motor car entails.

Unemployment is not caused by the growth of machine usage. Machine usage has always created more employment. A war born maladjustment between the prices of various products, so that they will not readily exchange, tariffs creating artificial price levels, these things are the real cause of the trouble. More and better machinery will go a long way towards getting us a solution.

In that man is above the animals, he is a user of tools. That he has turned these tools into weapons and war is inherent in human weakness. It may be necessary in his development. We are a long way from being gods. When I look at the architectural mechanism of a New York skyscraper or a transoceanic liner, an automobile or a dial telephone, and I know, as we men of the mechanical world are privileged to know, something of what lies behind these things, I think: No, we are not gods, but we have surely made tools that the gods might be proud to use.

# The FOREMAN'S ROUND TABLE

## The Outsider

"SAY, Al," exclaimed Ed as he stopped at Al's desk on the way to lunch, "Who was that guy going around with Williams this morning? He stopped at every machine in my department and I figured maybe Williams was going to sell them for junk."

"Full of curiosity, as usual, aren't you? That guy with Williams was a man with a mission, and his particular mission at this time is to try and improve backward departments like yours."

"Yeah? Quit your foolin'. Williams would never let an outsider come into the shop."

"Nevertheless he has done it. That man you saw was a consulting engineer, and he's already been engaged."

"I don't believe it. Those guys have ruined more firms than they have helped. I've heard Williams say lots of times that when a guy was a failure at everything else he became a consulting engineer. That guy with Williams didn't look as though he knew beans."

"I guess there was a time when what you say was true, but management has learned that it don't pay to have your shop turned upside down by a gang of outsiders, and industrial engineers have learned that they don't know more about shop operations than the combined staff of a shop. Superintendents have also learned that a competent man who understands the economics of shop management, and has nothing else on his mind, is a great assistance in raising the efficiency of the shop."

"Well, I never expected to see the time when Williams would humiliate his foremen like that. I think it is time for a self-respecting man to quit."

"Yes, I think so too, Ed. The town will be tickled to death to take care of another family. It sure is a swell time for a self-respecting man to quit."

"Well, that's the way I feel. You accept anything Williams does as O.K., but I prefer to do my own thinking."

"Yes, big boy, I've been in a position to observe the results of your thinking. That's why I prefer to have Williams do mine."

"I never expect to win an argument with you where Williams is concerned, but do you think it just fair to bring in experts to take away the jobs of the few men we have got left? I don't."

"You still have the old scientific management idea, Ed. Forget it. That idea is dead and buried. Only a single man will be put in the shop and he must sell his stuff, first to Williams, and then to you and me. If he can't do it, they'll send in another man, or withdraw from the job. They absolutely know that they can't do a thing unless the foremen cooperate. I think Williams is worrying a little about you and took the engineer into your department to size you up."

"Why should he worry about me? I kick, yes, but when Williams says, 'do this,' I do it. What I can't fathom is why he stands for this new idea himself. He knows more than any outside engineer, especially about his own shop."

"My dear Ed, I told you before that you had the wrong idea. The man that comes in does not have to be smarter than Williams, he acts as sort of an assistant to Williams, but instead of having a hundred things to do, he has only one, and all the time in the world to do it in."

"What can he find to do, then? There's no novelty in setting piece prices, and while, maybe the men are slowing down a bit just now, the machines are run efficiently, and goodness knows we have rules to cover almost any emergency. So what can any outside guy do?"

"He won't even set time allowances. What he will do is to make up standard time charts showing how much time different jobs should take, how much time they actually take and how and when time is lost. From these charts, each foreman can see just how efficient his department is, and Williams can see how efficient the whole shop is. If he does not want to improve conditions, it's up to him. The outsider merely visualizes things in terms that are comparable. The rest is up to you and me."

"Well, any way, let's forget it and eat. The whole thing makes me sick to my stomach, but maybe I can nibble on some ham and eggs."

**Is now the time to improve shop conditions, so as to be ready for a revival of business? Is the new conception of scientific management service better for the shop force? Can definite instances be cited?**

## • Discussions

### Old Man Opportunity

The urge to learn among men who have worked varies with business conditions. Registration in evening trade schools, for example, is smaller when the shops are not busy.

The attitude of the majority of the unemployed men seems to be that it is not worth while to study while there is no visible chance to apply their added knowledge.

The wisdom of adopting a plan to allow temporarily laid off men to learn in their own shops seems to be questionable. Under such conditions, loafing around would be encouraged as the shop would be overmanned at all times. The men who are in to learn must have work to keep busy. This would make it necessary for the men being paid to do less or be teachers. The whole situation would tend to the breaking down of discipline and give the men an alibi for delayed production. —L. F. SWENSON.

### On the Spot

The notice issued by Williams does not go far enough. When the foreman wants information from the office it is better that he should remain in his department and ask the particular individual required to pay him a visit, if at all possible. Some people are afrad that to be sent for is an insult to their dignity, but experience in this practice shows that a courteously worded request is always complied with. In our establishment, it is the recommendation (not the rule) that foremen leave their departments only when absolutely necessary. ROY V. WADE,
*Glasgow, Scotland.*

### Treasure Chests

Has it ever occurred to the general public that the status of the president of the company is to the stockholders as the foreman to the president, or the workman is to the president, or the workman to the stockholder.

If it is to the interest of the foreman, of the president, of the stockholders, for the workmen to put suggestions in a box, why is it not far more to the interest of the stockholders for all officials, no matter what their status, likewise to put their suggestions in the box, signed with their names, for the consideration of a stockholders' committee. Why not all suggestions placed before a stockholders' committee instead of before a committee of officials?

Workmen have their suggestions picked to pieces by the bosses, but workmen have been known to quit and organize highly successful business enterprises. Engineers and designers have been compelled to redesign to favor some idea of an official, yet engineers and designers bring out successful machines and put them on the market as designed.

Are the officials afraid of the paucity of their own efforts that they shrink from following a plan that they recommend for the worker. Will any firm survive long without suggestions? —C. G. WILLIAMS.

### Muzzling the Press

An intuitive sense of what is right and proper and what subjects to avoid is at all times conducive to harmony, particularly between employer and employee. Expressions of opinions should be regulated by tact. Any suggestion covering the solution of a subject that has become an issue, should not be made the subject of remark to anyone except the employer, or his representative.

Sometimes, even a shop sweeper may have an idea from which his employer could benefit. He should be encouraged. But for this same sweeper offensively to parade his opinion in the presence of others, if his suggestion has not met with favor, is extremely untactful, and tactless men are nearly always in ill favor.

Broad-minded executives are glad to have suggestions that may help to advance the company's fortunes, but if the management fails to find sufficient appeal in such suggestions the tactful man will wait advances from his employer before reopening the question.

—HOMER A. HERR, *President, Automatic Centrifugal Company.*

### Run-of-Mine

There are many things to consider in selecting and keeping good men in the shop. Any employment manager who cares to listen, will soon find out why good men prefer this or that company. Wages play a great rôle in the mind of men looking for jobs, but equally important is the knowledge about a certain company's policy as regards the length of employment usually given. Many good men prefer moderate wages and a steady job to high pay and uncertain employment. Any shop that "fires and hires" will be a gathering place for men who cannot find employment elsewhere.

I do not believe that men are less skilled or efficient than they were ten or fifteen years ago. I think, however, that the treatment given a white-collar man is more courteous than many of them deserve and out of proportion to the lack of deference shown men at the machine and work bench. If any manager is dissatisfied with his men, he ought to find out why his men do not come up to his standard. And if there is anything he can do, he should be broadminded enough to consider the men as his helpers and try to straighten out things for them. He should make wages and working conditions as attractive as possible. Then he will be surrounded by men doing their duty and sharing the responsibility.

—A. E. FRISTEDT,
*Stockholm, Sweden.*

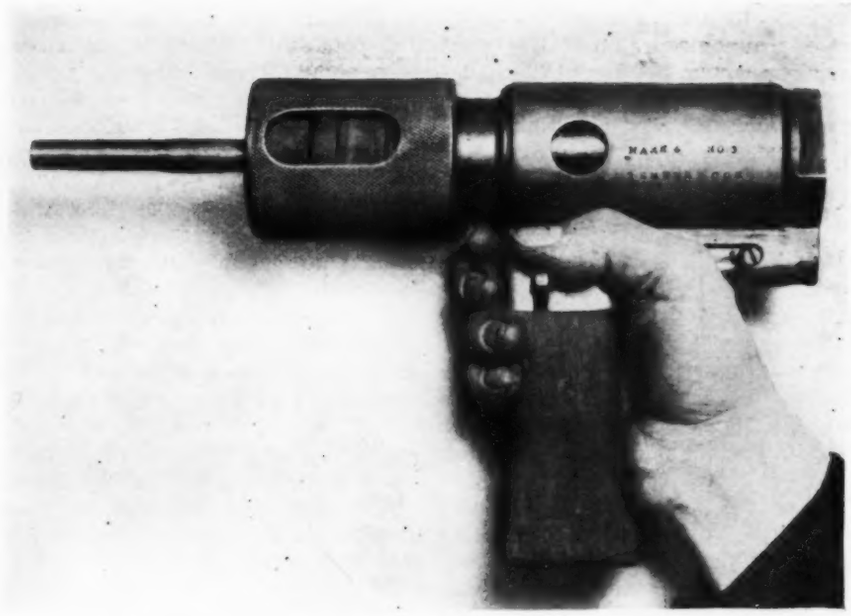
### Carelessness

A man, who consistently or inconsistently breaks the rules of order and safety, must be penalized, and the best way is by making him lose time and money. Students of industrial health and safety, now rate certain persons as "accident prone" or especially liable to accident. If these persons are otherwise useful, provision is made to utilize their talents where they cannot injure others or cause excessive damage. If their tendencies are caused by other conditions, either inside or outside the factory, remedies can usually be found.

The difference between carelessness and errors of judgment would seem to be the literal interpretation of the words. Thus carelessness is lack of care or thought, while errors of judgment mean doing the wrong thing at a crucial moment—in the former case, no thought at all, and in the latter misapplied thinking. If a bonus is given for good work, and is earned, showing that it is possible to do such good work consistently, then a penalty for work under standard is not only equitable, but desirable.

—JOHN S. ISDALE, *Plant Engineer, International Silver Company.*

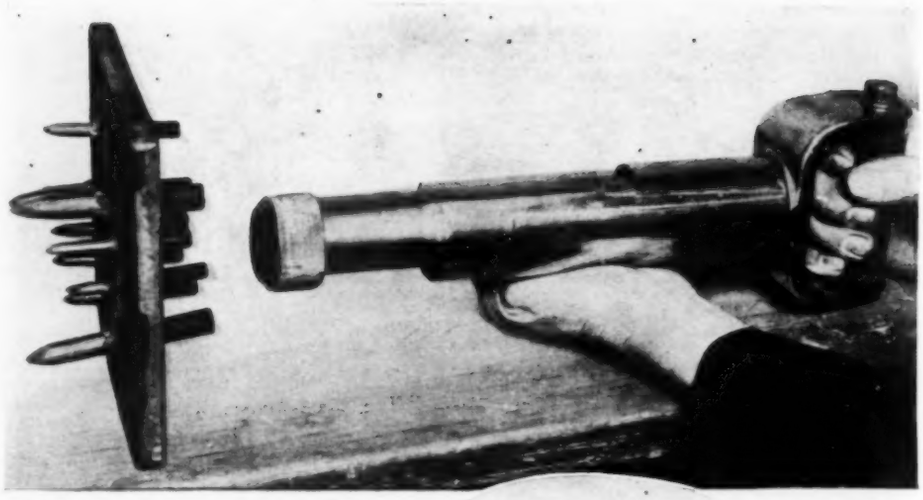
# Gunpowder



Primarily a steer killer, this type of gun can be used for light riveting. It is self cocking and heads a rivet, within its capacity, at one blow

(Right)
A quick loading gun for use above water. Note that, irrespective of the size, the threaded ends of the projectiles extend a uniform distance from the plate. In use, the gun muzzle is placed against the plate

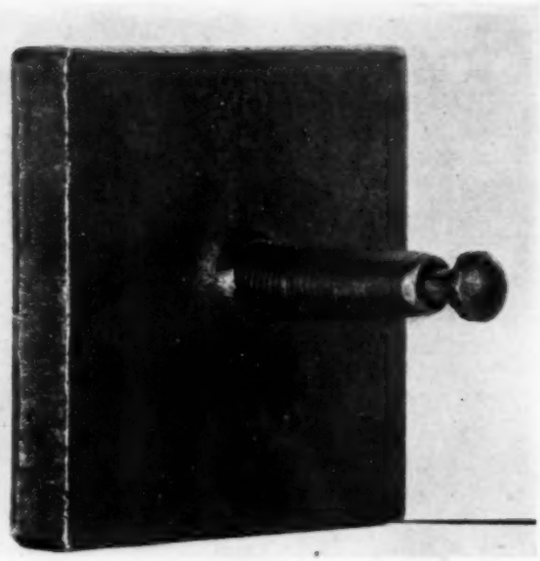
(Below)
A break-pin, extending from the rear of the projectile through the separate cup-shaped powder chamber, holds both of them against the cartridge head until the firing pressure build-up releases them. As the powder chamber fits the bore, the projectile need not



Only a small blank cartridge is necessary to clamp two cable ends so that the cable will break before pulling loose. Delayed action is secured by compressive resistance instead of by a break-pin

# Further Invades Industry

**The Temple gun has been developed to do easily several formerly difficult jobs. Some of its feats appear little short of miraculous. With a grain of powder it develops two tons pressure and has neither report nor recoil**



**The small rivet-shaped slug shown in the end of the nipple was cut from the plate. The end of the nipple is not marred. There is no drag of metal as the nipple passes through the plate**

THE TEMPLE GUN was first introduced to the readers of A.M. on Feb. 6, 1930 (page 245 Vol. 72). At that time there was speculation as to its future development and application. Since that article was written many inquiries for further information have been received. The description and photographs here given summarize the latest developments in this field.

It will be remembered that the gun was originally developed for use under water. An illustration showed a patch placed on a tank under 180 ft. of water, while the tank itself was under a pressure of 200 lb. per sq.in. Such performance is made possible by the fact that the muzzle of the gun, when thus used, is sealed by a copper disk, and is placed directly against the object that is to receive the stud.

The secret of the Temple gun is delayed action. There is a distinct time lag between the explosion of the powder and the start of the projectile. In the type of gun that shoots studs and nipples this delayed action is obtained by attaching the projectile to the head of the cartridge with a break-pin. When the explosion takes place, pressure is built up between the cartridge and projectile until it reaches a point sufficient to break the pin. Confined as it is between projectile and cartridge, this pressure can cause little recoil. When the break-pin lets go the projectile starts with a velocity estimated at 5,000 ft. per sec.

As a result of confining the explosion until pressure is built up, energy is secured in the order of 2 ton per grain of powder by weight, many times the efficiency secured by the usual method. Observe the cartridges on the opposite page. They are about $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter and the powder chamber itself is not over $\frac{5}{8}$ in. long. Running through the center is a $\frac{1}{4}$-in. break-pin necked down at one place to $\frac{1}{8}$ in. in the case of a $\frac{1}{2}$-in. projectile. This efficiency makes it possible for a man to hold in his hand a tool exerting 100 tons or more of energy and feel no more shock than from an air hammer.

Where the gun is not to be used under water, the sealing precautions are not necessary, and a gun comparable in rapidity of firing to the usual magazine gun is possible. Such a gun is used for shooting nipples and studs up to $1\frac{1}{2}$ in. in diameter. These various projectiles are used for tapping into gas and water pipes under pressure, chemical tanks, or for similar uses. Under water the gun can shoot a pipe connection into a sunken submarine or wreck. The studs are used to patch a wreck, to fasten crossarms and brackets to steel telegraph poles, to pin structural members together before welding and similar uses.

The natural reaction is to doubt the efficacy of a stud shot into a plate, but a $\frac{1}{2}$-in. stud shot into a plate $\frac{1}{2}$ in. thick requires a force of 7 tons to remove it. The flow of the metal in the plate is not in the direction the projectile is going, but at right angles to it. This is shown by microphotographs and visually by the fact that there is as much burr on the top as on the bottom of the plate. The holding power therefore is much greater than the strength of the stud, even with a large factor of safety.

One of the illustrations shows a single nipple shot through a $\frac{1}{2}$-in. plate. There is no marring or distortion of the nipple and a cross-section microphotograph of similar nipples shows that the metal has closed in and filled the threads. The threads themselves show no sign of upset or mutilation.

Because of the burr thrown up on top of the plate, if two plates, such as a patch on a boiler, are to be fastened, it is better to drill holes in the patch considerably smaller than the outside diameter of the stud, say a $\frac{3}{8}$-in. hole for a $\frac{1}{2}$-in. stud. The projectile for such work is provided with a wooden guide plug that extends from the muzzle of the gun. This is inserted in the drilled hole and disappears when the shot is fired. The plates are drawn together as though pressed hydraulically.

The makers of the gun have no idea that it will displace rivetting with the air hammer, but there are places where the gun can and will be used. It is particularly adapted for field work where air is not available. Either the gun or the pistol will head a good-sized rivet with a single shot.

# What Makes a Floater

**The why-girls-leave-home problem has its counterpart in why men quit jobs. Here is an intensely human and enlightening article in which a conscientious workman explains why he became a floater. There is more than a passing moral for a certain type of management in this exposition of employer-employee relationships**

ON THE 4 x 6 in. cars in the private files of several personnel directors you will find me keyed as a "floater." This means that while I may be a good worker it is not considered advisable to put me in a position of dependability because I may unexpectedly quit. This is quite true if you remove the word "unexpectedly," for I do not resign unexpectedly. My fault, if you want to call it a fault, is a strong resentment against some of the things that occasionally one of those individuals known as an executive attempts to force upon his employees. Now don't misunderstand me, there are many fine ideas put into operation at various times, but occasionally, and I am sorry to say altogether too frequently, something is jammed upon a department that is simply a concentration of misery and grief that some of us will not endure.

### A Leaky Roof—I Start Floating

Some years ago, in a small Eastern plant, I rose to the position of engineer; that is, I punched the time clock about forty-five minutes earlier than the rest, got up steam and had the shafting running before the whistle blew and kept it turning at 200 r.p.m. until the whistle finally blew at night. About forty-five minutes later I punched out for the day. Through some ruling I received credit for only the same hours as the other employees because, as the superintendent explained, the company would not permit special favors to be shown to any employee as it tended to break down the "morale." However, to balance up he gave me the extra job of watching for twelve hours on Sunday at the watchman's very low rate. Then he casually mentioned that I would also be expected to oil all machinery, mend and tighten belts, do any necessary babbitting or other millwrighting that was urgent, in addition to making the rounds. Naturally I found difficulty in expressing my appreciation and did not, at the moment, have pep enough to ask if the reason they did not pay a millwright's rate for this work was for the fear of jeopardizing the morale of the other watchmen. This was bad enough but it was nothing compared to the way I felt when later developments proved it was the superintendent himself who made all these rules.

The starting of my floater complex, however, did not occur until about six months later when my request for six rolls of cheap roofing paper was turned down flat. It was this way: there had been a heavy storm during the night and in the morning I discovered about a third of the boiler house and engine room roof had been ripped off. So the moment the superintendent arrived I asked for the six rolls.

"There's no need to buy any roofing," he snapped without even taking the trouble to view the damage. "Just patch up the holes with some pieces of sheet steel."

After a search of the shop I could find only some special number sixteen-gage production stock that cost something like fifteen cents per square foot, whereas the roofing material I had asked for would have cost about two cents per square foot. It did not seem right to waste so much money, but the superintendent was very touchy and always impressed everyone with the fact that when he made a decision it "stayed." Therefore I nailed up over five hundred square feet of the pickled and straightened sheet steel. Then I went back to the office and put in a requisition for a couple of gallons of roofing paint. To my astonishment the superintendent refused to O.K. this, and my protest that the steel would rust through in six or eight months was answered by the statement:

"Then you'll have to hunt up some more."

Well, the steel did not last even the six months, and when the rain once more started dripping into the engine room I simply could not stand the idea of taking another load of steel from the production department. So I went direct to the president, who was of German origin and had a military slant on life. He did not wait long enough to discover what I came to see him about before he ordered me to make all reports to my immediate superior, so I turned and went direct to the superintendent's office, found him there, got a load off my chest, quit, and started my career as a floater.

### Same Old Story—Rate Cuts

My next job was piece work and in a couple of months I was earning a decent wage. It was better than I had ever earned before, and with Sundays off, I was happy and contented. This state lasted about three months. Then one morning about nine o'clock a quite disagreeable youth with a piece of board and a couple of stop

watches came up to my machine and without a word or a smile started timing every move I made. I did not know just what the idea was, but concluded that the company was simply trying to find out if I really was doing a day's work for my wages, and feeling grateful for my better income. I went along at my regular rate. This, by the bye, was a good clip. At the end of the week the piece rate department sent word to my foreman that the rate on my job was cut. When he told me about it I was dumbfounded. I knew I was the best producer there and did first class work; in fact my output was almost 50 per cent more than my predecessor. This, of course, meant a big saving to the company, because with the same floor space, the same overhead and the same general expense, they were getting 50 per cent more product. Therefore, why should they single out and punish me? The foreman said I evidently wasn't "wise" and that the efficiency expert would never stand for me getting so much in wages. It occurred to me that this was another case of disturbing the morale of others, so once more I floated.

### Two Breeds of Manager

At the next plant, I discovered another super-efficient manager in charge. He made quick decisions and never changed anything he had said—it was a kind of fetish with him. He made his production estimate for the last quarter of the following year, and he estimated high, for he believed a new method he had just installed would increase production at least 20 per cent with the same help. It was not until late in November that he realized it would be impossible to make the schedule, working regular time. Then he cut loose and blew up. We had to work every night, until ten o'clock, and we had to work all day Sundays. Just before Christmas day the news leaked out that the machines on order had to be finished for sure by the 31st of December in order to be ready for foreign shipment. We worked all Christmas day and up to ten at night as usual and we also had to work up to three o'clock in the morning New Year's day, before the last machine passed the inspection department and was rushed into the store room.

About the middle of January we found out that the only reason we had to rush those machines through was so the manager's schedule would be completed according to his estimate. The very slick rumor about a foreign shipment was started as an extra incentive to get the men to use every possible effort to rush the job, and although the manager denied he had anything to do with starting it, he certainly made no effort whatever to stop it. Anyhow, what with this and more like it, a good many of us quit as soon as we could find new jobs.

Next I became a foreman of a medium-sized machine shop where about thirty-five men were employed. We built special machinery and in between times made up a stock of standard mill supply parts such as friction clutches, couplings, and bearings. Things went along smoothly until well into the summer when one afternoon, while I was with a group of men who were erecting a large machine, the manager came striding in. Fire seemed to be flashing from his eyes, and he immediately pounced upon me and gave me the worst bawling out I have ever heard, right in front of my men. For several minutes I was at a complete loss to understand what the trouble was, then it developed that a friction clutch we had shipped to a mill in a small town, about two hundred miles away, could not be made to transmit its load. The firm had called up on the phone and said we would have to send a larger one for they could scarcely operate even at reduced load. The manager said it obviously was due to sloppy work, careless inspection, and a total lack of interest that let such a rotten job go out. He never gave me an opportunity to answer a word and banged out of the shop without saying what he wanted done about it. Now, I had a fine bunch of men and I felt certain there must be a mistake somewhere, for we were producing first class work. As no instructions came from the office, I went to see the manager just after four o'clock, but found he had left the plant. Of course I was worried, and finally I decided to take the night train and visit that mill at my own expense. After arranging with my assistant to look after the shop, I went down on the eleven o'clock train that night.

In the morning I met the superintendent of the mill, told him my name and position and asked if I could see the defective clutch. He seemed greatly astonished and said that the clutch was working fine and there was absolutely nothing the matter with it. Then he explained that after it had been installed by their men they found it would not transmit the load, and they even had to tie the shipper hard over before it would handle a small portion of the load. He had called up the manager of our plant for advice and had been told to go very carefully over the installation again while a check-up was made to see if a larger clutch was in stock. The superintendent during the check-up then discovered that his millwright had somehow got the toggles reversed before placing the stop collar in position. They slipped the collar back, reversed the toggle levers, returned the collar to its proper position and immediately everything was entirely satisfactory. The superintendent next said that he had immediately called our manager back and explained to him what the trouble had been, that they both had a laugh over it and the incident was closed. This was the reason for his surprise at seeing me walk in.

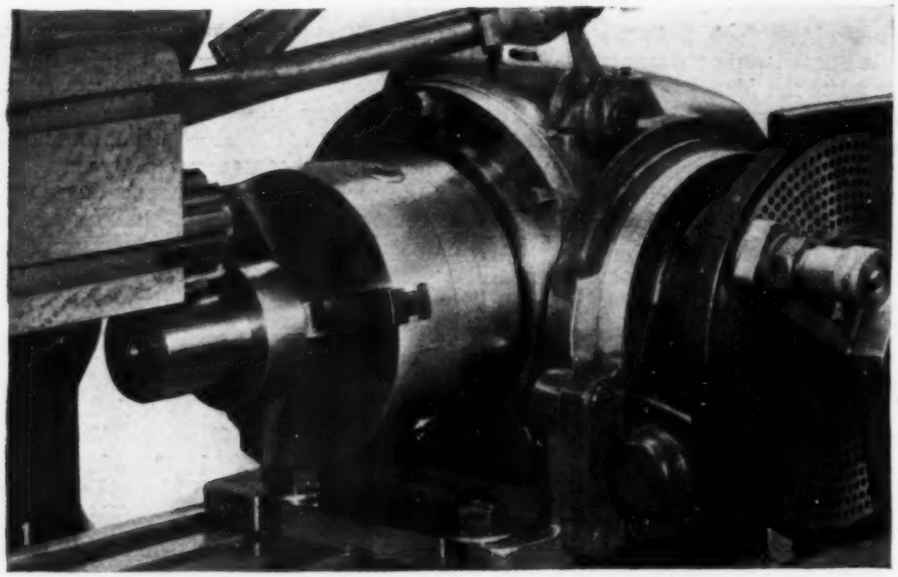
I got back to the plant at three-thirty and found that the manager had not yet left. I asked him, point blank, if he had been told that the clutch was O.K. He said he knew it yesterday. Then I asked him if it ever occurred to him that the decent thing to have done would have been to come back to the machine shop and apologize to me for the things he had said, and to do so in front of the men that were present when he "bawled" me out? I also made several other remarks about bosses who thought they could treat their employees like so much dirt and get away with it. Then I quit and floated on.

### Safe Harbor

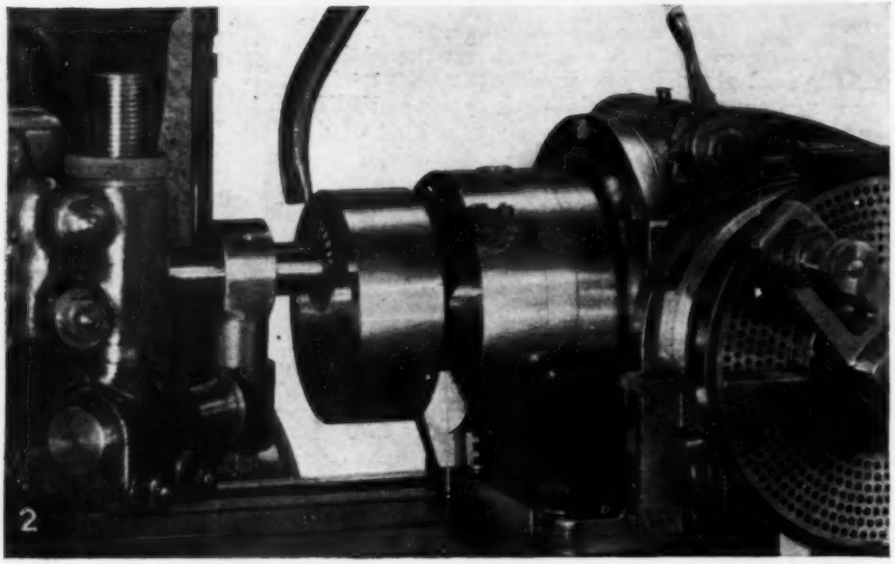
Right now I am working for a large corporation, and the plant management certainly are a square dealing bunch. Our rates are fair, working conditions are excellent, and as long as we do our share in a workmanlike manner, we are not interfered with in any way and our spare time is—our spare time. So long as these conditions last I shall give my best efforts and hope the company will reciprocate with permanent employment.

Before closing I want to add that I never lose an opportunity to tell my friends and acquaintances what a dandy firm I am working for and try to induce them to use our products when they can. In this way, I endeavor to repay my employers a little extra for their good common sense and also to help keep orders coming in so they will continue to need men, which includes me, to help fill them.

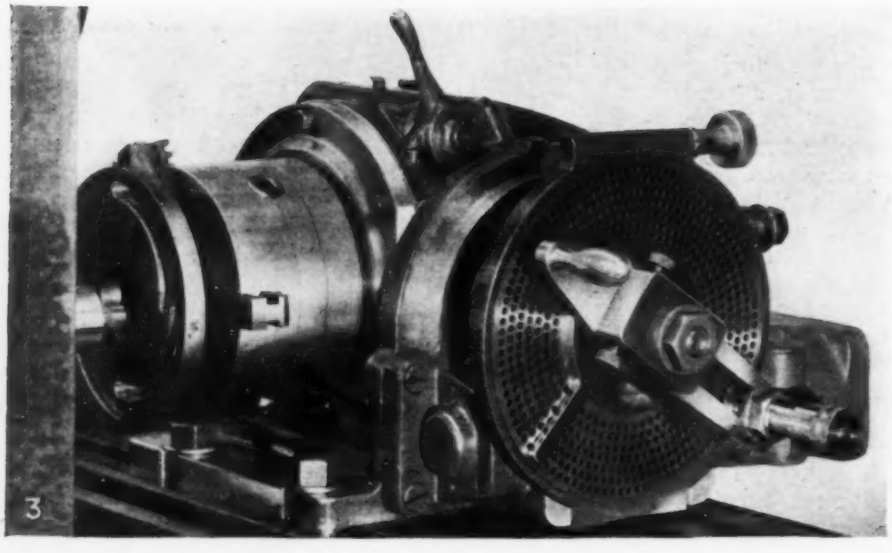
# Unusual Operations on a Standard Milling Machine



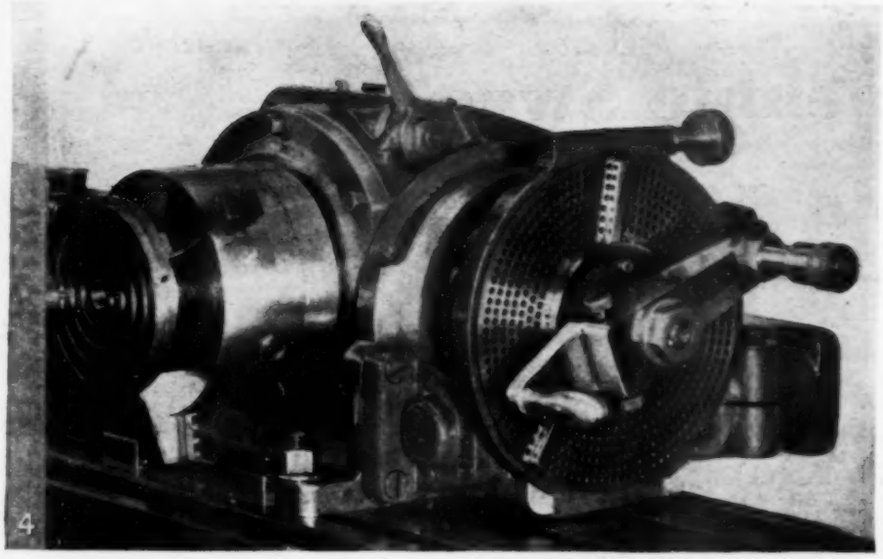
[1] A stud is milled using a regular thread hob and a thread milling attachment. The knee of the machine is elevated until the cutter has sunk into the work the desired depth. One revolution of the head completes the thread

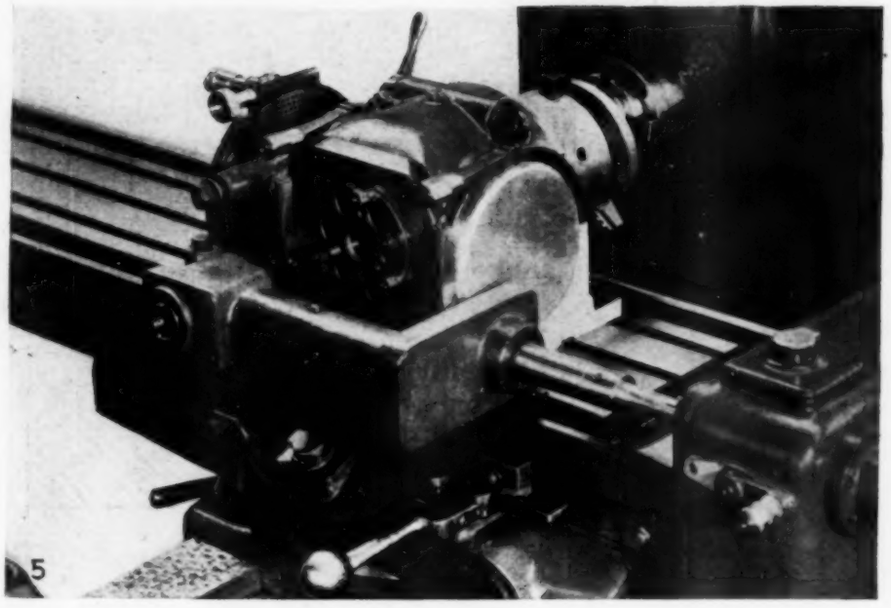


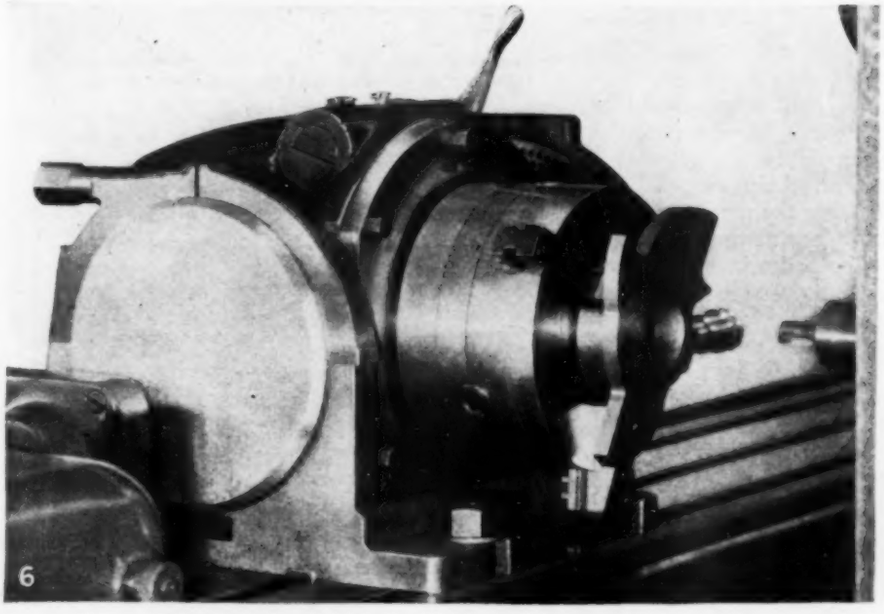
[2] An internal thread is milled in a ring. The cutter is held on an extension to the spindle of the thread milling attachment. In place of the follower, a special outboard bearing is provided



[3] Eccentric slots are machined in a fixture plate. The width of cut is $\frac{1}{2}$ in., the depth, $\frac{1}{2}$ in., and the lead, 0.750 in. for this job







**Not mechanical stunts, but practical methods of machining, are these out-of-the-ordinary jobs**

Photographs by courtesy of Kearney & Trecker Corporation

[4] An end mill set to the proper depth completes this scroll in one cut. The table advances as the chuck rotates. The depth is $\frac{1}{4}$ in., the width of slot, $\frac{1}{4}$ in., and the lead, $\frac{1}{2}$ in.

[5] How it is done. This right angle attachment brings the spindle of the dividing head in line with the spindle of the milling machine making the machining of the scroll and eccentric slots possible

[6] It's hard to believe, but one cut completed this screw machine cam. The leads were figured out beforehand and put on the blueprint. At the proper degrees of rotation, the operator switches the change gears in the dividing head, and the correct shape is formed

# Machine Swaging as a Modern Art

H. R. LE GRAND
*Assistant Editor*

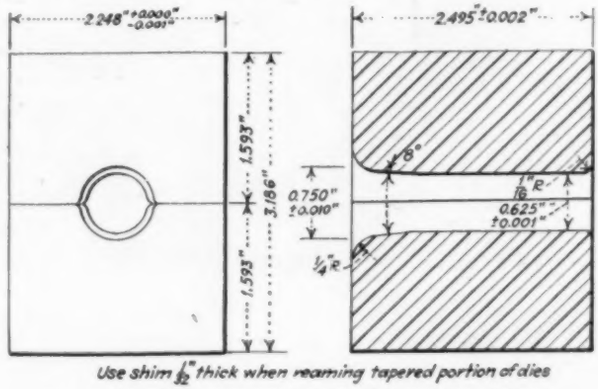
**Continuing a thorough review of swaging, this article covers limits in tapers on solid and tubular work, examples of simple and difficult jobs with production data, and die design**

ALMOST ALL parts are swaged cold, but parts small or large may be swaged either hot or cold. The choice depends wholly upon the following considerations: toughness of the material; whether solid or tubular; the reduction required; and the angle of the taper between the reduced and original diameters of the piece. Some work can be swaged more rapidly and with less power if done hot, but offsetting these advantages is the cost of heating and the equipment therefor. Annealing may have to be resorted to where rapid work hardening is encountered. No set rules can be laid down. As in many lines of work, it is best to consult the builders of the equipment until sufficient experience is obtained. Nevertheless, several generalizations on swaging practice can be passed on, it being borne in mind constantly that *abrupt shoulders and abrupt tapers are undesirable.*

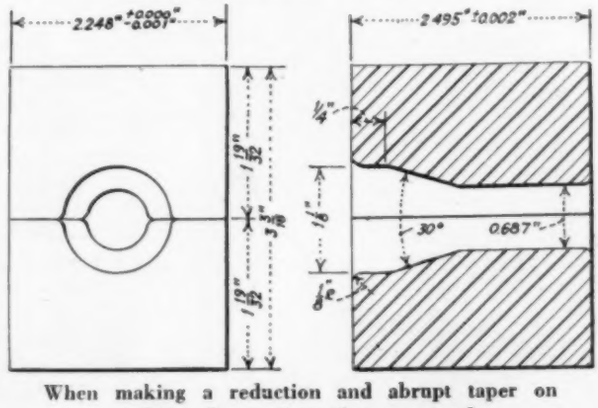
Before discussing the limitations of the rotary swaging process on solid and tubular work, the construction of the dies should be understood. There are two major operations in making these dies—first, boring and reaming the portion of the hole, straight or tapered, that finishes the work, and second, boring the tapered mouth where the material enters. The tapered portion at the mouth of the dies is not always made smooth because slight roughness prevents the material from jumping back. In addition, "side clearance" must be provided to prevent marking the work. This is obtained by blocking or shimming the die faces apart by an amount up to 10 per cent of the finished diameter. The hole is bored the equivalent amount over size. When the shims are removed and the die faces placed together, the bore is minutely egg shaped, the long axis following the parting. Since most of the swaging action takes place at the die bottoms, the side clearance does not have a detrimental effect on the shape or finish of the work, but does prevent pinching it between the edges of the die impressions. Furthermore, the edges of the die impressions are given a small radius.

With solid rods only a small reduction can be made at one pass, since it is more difficult to cause the material to flow than for tubular work. For rapid operation, the taper at the mouth of the dies should not ordinarily exceed an 8-deg. included angle when the material is worked cold, but angles to 15 deg. are possible with hand feeding. When hot working is employed, an angle of 45 deg. at the mouth of the dies can be used, in which case the machine is provided with a feeding fixture of sufficient thrust.

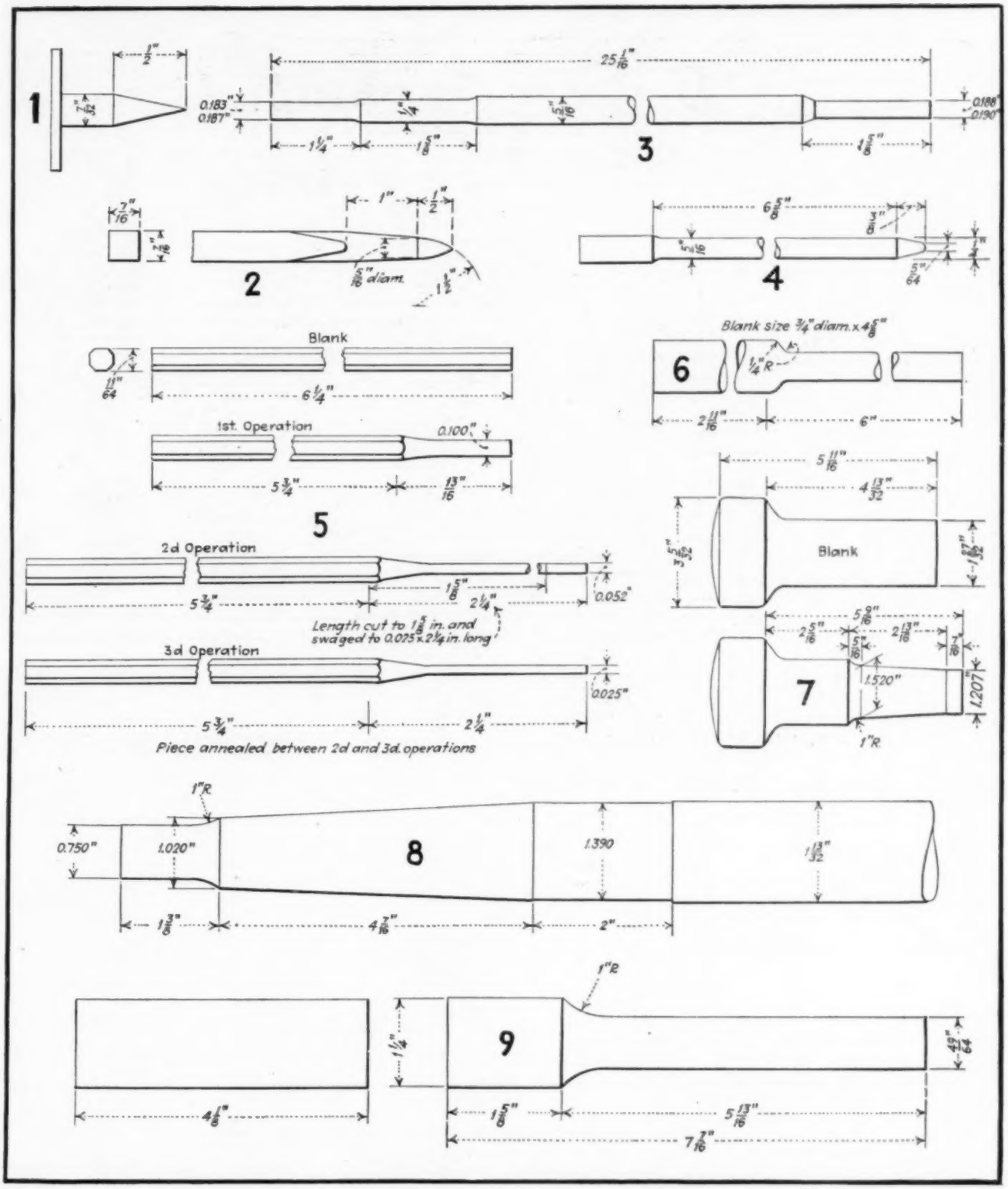
Dies used for straightening and sizing tubing are bored out to the exact size required. For reductions of $\frac{1}{32}$ in. or less, a radius at the front end of the die is enough to permit the stock to enter and avoids marking it, but the operation is slower than if a taper is used. For greater reductions it is recommended that the front end of the die be given a 7 to 8-deg. taper and a radius, the large diameter of the taper being slightly larger than the stock. After hardening, the dies are ground with packing between the faces to give clearance, which varies from 0.005 to 0.020, depending upon the hardness of the stock




**Dies for reducing the diameter of solid stock or heavy walled tubing. Such dies are used for pointing rods before drawing**




**When making a reduction and abrupt taper on tubing, dies such as these are used**

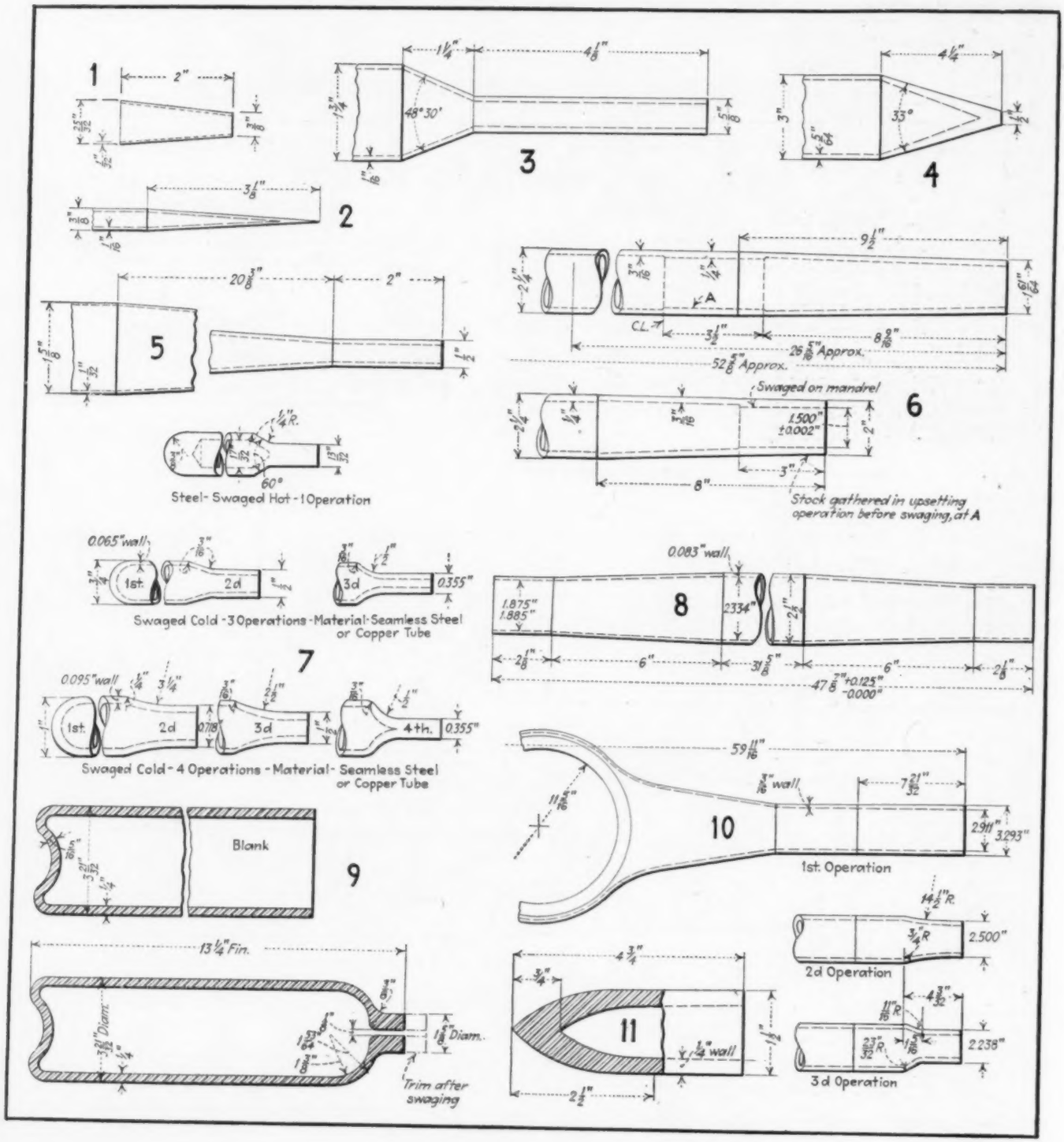



## Solid Articles Swaged by the Rotary Process

| No. | Makers* | Piece | Material | Operations | Feed | Time | Hot or Cold |
|---|---|---|---|---|---|---|---|
| 1 | S | Spike | 0.01 to 0.15 carbon steel | 1 | Hand | 5 sec. | Cold |
| 2 | S | Meat hook | C. R. steel | 1 | Hand | 12 sec. | Cold |
| 3 | L | Throttle rod | S. A. E. 1010 steel | 2 | Rack | 10 sec. each end | Cold |
| 4 | S | Cotton picker spindle | Nickel steel | 1 | Hand | 25 sec. | Cold |
| 5 | L | Explorer blank | Tool steel | 3 | Hand | 2 per min. | Cold |
| 6 | L | Valve stem | Stainless steel | 1 | Pneumatic | 3 to 4 per min. | Hot |
| 7 | L | Stub shaft | Carbon steel | 1 | Hydraulic | 2 per min. | Hot |
| 8 | L | Axle | S.A.E. 3140 steel | 1 | Hydraulic | 2 per min. | Hot |
| 9 | L | Core | Silicon steel | 1 | Pneumatic | 6 per min. | Hot |

*L — Langelier Mfg. Co. S — Standard Machinery Co.

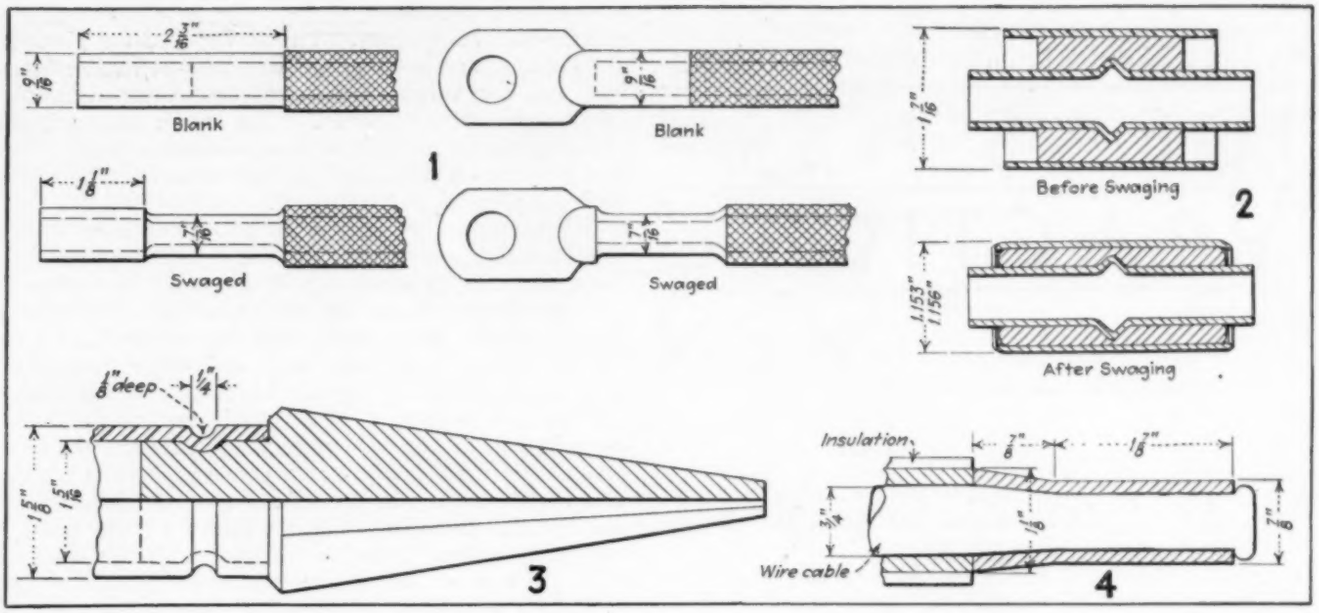
Feeds: Hand—hand-operated slide; Rack—power-operated slide




## Tubular Articles Swaged by the Rotary Process

| No. | Maker* | Piece | Material | Operations | Feed | Time | Hot or Cold |
|---|---|---|---|---|---|---|---|
| 1 | S | Hoe ferrule | Steel | 1 | Hand | 8 sec. | Cold |
| 2 | S | ..... | Aluminum | 1 | Hand | 5 sec. | Cold |
| 3 | S | Electric soldering iron | Steel | 4 | Rack | 20 sec. each operation | Cold |
| 4 | S | ..... | Copper | 1 | Rack | 30 sec. | Cold |
| 5 | S | Auto horn | Brass | 2 | Hand or rack | 25 sec. per operation | Cold |
| 6 | L | Front axle | Seamless steel | 1 | Hydraulic; pneumatic gripping jaws | 150 ends per hour | Cold |
| 7 | L | Thermometer bulbs | Copper or steel | .. | Rack | 250 operations per hour | .... |
| 8 | L | Propeller shaft | Steel | 1 | Hydraulic | 3 ends per min. | Cold |
| 9 | L | Bottle | Steel | 1 | Pneumatic | 2 to 3 per min. | Hot |
| 10 | L | Welded rear axle housing | Steel | 3 | Hydraulic; pneumatic expanding chuck, pneumatic locating tailstock | 2 operations per min. | Cold |
| 11 | L | †Shell blank | Shelby tubing | 1 | Rack | 4 per min. | Hot |

*L — Langelier Mfg. Co. S — Standard Machinery Co. †Experimental.
Feeds: Hand — Hand-operated slide; Rack — power-operated slide.




### Assemblies Swaged by the Opening-Die Rotary Process

| No. | Maker* | Part | Material | Operations | Time |
|---|---|---|---|---|---|
| 1 | L | Cable terminal.... | Copper tubing.. | 1 | 8 per min. |
| 2 | E | Spring bushing.... | Steel tubing.... | 1 | ..... |
| 3 | S | Well point..... | Steel tubing.... | 1 | 20 sec. |
| 4 | S | Wire cable..... | Copper tubing.. | 1 | 20 sec. |

*E—Etna Machine Co. L—Langelier Mfg. Co. S—Standard Machinery Co.

and the accuracy required. The dies should come together on most work.

When swaging long tapers on comparatively thin-walled tubing, it is not usually necessary to anneal between reductions. On making large reductions, however, annealing is more likely to be required in order to avoid splitting. Abrupt shoulders on heavy-wall tubing are best swaged hot and finished by cold swaging. Tubes made with a welded seam have proved difficult to swage without cracking. Work of this character is facilitated by making a light reduction at each pass and annealing between operations. When only a straightening operation is to be done, a reduction of $\frac{1}{16}$ to $\frac{1}{32}$ in. is sufficient.

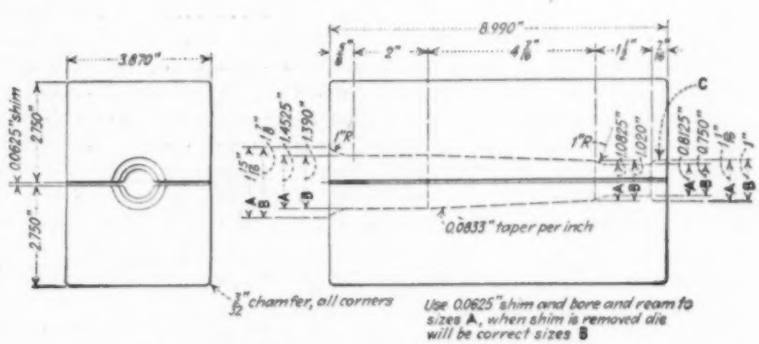
For tapered work, dies are made in much the same way as for straightening except that side clearance is required to allow for feeding of the stock. The amount of clearance is best found by trial of the dies in the swager. Too much side clearance has a tendency to split tubing or to "pipe" solid stock, and too little clearance results in the corners of the die marking the work. Tapers of 20 deg. or less for steel and of 15 deg. for brass have been found best when stock is fed by hand. Large angles increase the kick-back and usually necessitate mechanical or hydraulic feeding and hot working.

Dies used for swaging tubes over a mandrel are made in much the same way as outlined above. The operation is used for sizing and improving the internal surface, as well as removing burrs. Wall thickness can also be decreased. Enough side clearance must be given to prevent the tube from gripping the mandrel. On stock up to 16 gage the side clearance recommended is 0.002 to 0.005 in. For heavier stock it is increased slightly. The mandrel itself is made from 0.004 to 0.007 in. smaller than the inside tube size desired and its front end is tapered to about $\frac{3}{16}$ in. undersize. The mandrel is set so that its full-size diameter is slightly back of the full size part of the die. At its front end the mandrel is threaded, screwed to a rod inserted through the tube to be swaged, and the rod is hooked to a support that holds the mandrel in correct position as the tube is fed over it into the die.

In making dies for four-die machines much the same practice is followed as for those used on two-die machines, except that little if any side relief is required.

The article to follow will discuss reciprocating machines.

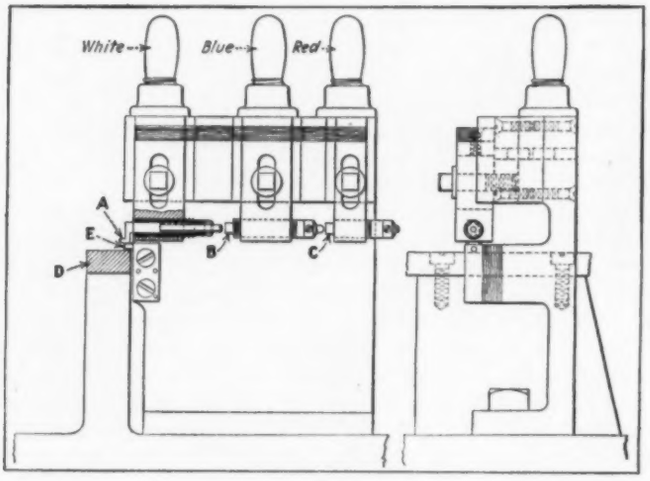
The second of three articles reporting the progress of swaging to date.




**Dies used for hot swaging an axle in one operation. The rear of the die *C* is bell mouthed merely for clearance**

# IDEAS from PRACTICAL MEN

## An Automatic Inspection Fixture




WILTON F. HOAG

RAPID and positive inspection of hardened and ground parts having surfaces at 90 deg. to each other was proving to be a real burden until the fixture illustrated was placed in service. Since the angularity of the parts had to be held to close limits, the eye strain and consequent inaccuracies over a period of time resulting from the use of a try-square, are well known to all who have tried this method of checking parts of this nature.

The vertical heights of the surfaces to be inspected range from $\frac{1}{4}$ to $\frac{5}{8}$ in., the parts averaging $3\frac{1}{2}$ in. in length. Tests are made at three points on the vertical surface in a horizontal plane. This three-place test is necessary because of the twist that hardened and ground parts of this nature will sometimes develop in the grinding process. A previous fixture using indicators was found to be unsatisfactory, requiring too much attention for reading on the part of the operator. The results obtained with the present fixture do not depend upon the skill of the operator, as the fixture is rigid enough to stand any ordinary over-pressure against the fixed stop pin.

The base can be any suitable plate or casting having short legs attached. It should be long enough to accommodate a transformer of the type supplied with toy electric-railroad systems. The spring-actuated plungers *A*, *B* and *C* are mounted on vertically-adjustable housings and are wired to a circuit controlling three 6-v. lamps of different colors. The space between the plungers can be adjusted within reasonable limits. The plunger *A* has a movement of 0.003 in. before it contacts with the plunger just behind it.

In operation, the piece to be tested is placed on the hardened and ground bar *D* and is held down with sufficient pressure to insure good contact. The piece is moved sidewise on the bar until one end of its vertical surface comes into contact with the plunger *A*. Continued further movement in this direction moves the plunger inward and brings the lower part of the vertical surface into contact with the stationary stop *E*. The piece is then slid endwise until the middle and the other end are, in turn, brought into contact with the plunger and the stationary stop. If none of the lamps is lit during this procedure, the angularity of the piece is enough less than 90 deg. to prevent its being salvaged. This piece is, of course, rejected. If the white lamp is lit, the angularity of the piece is still less than 90 deg., but the error is not great enough to prevent the piece from being salvaged.

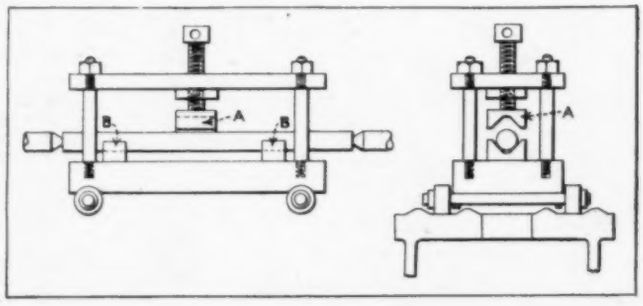
If the angularity of the piece is accurately 90 deg., plunger *A* will be forced back into contact with plunger *B* and both plungers will be moved enough to close the circuits controlling the white and the blue lamps, and both these lamps will be lit. If the angularity of the piece is greater than 90 deg., all three plungers will be brought into contact and will be moved enough to close the circuits of the three lamps, which will all be lit. In this case, the piece can be salvaged by regrinding.

A high degree of sensitivity is obtainable, as a gap of 0.0002 in. between two of the plungers will preclude light indication. Inspection proceeds at a rate as rapid as it is possible to handle the pieces. Acceptance or rejection follows automatically as a reflex of the effort required in handling the work. The same principle has been applied in building several other inspection fixtures during the past four years and has not failed to give satisfactory results.

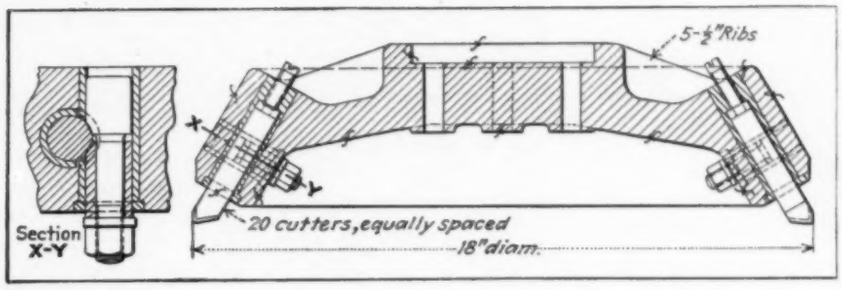
## Straightening Work in the Lathe

CHARLES KUGLER

The device shown was made in a repair shop where considerable of the work consists in straightening shafts and long screws. The exact dimensions of the parts are not important so long as they are strong enough and the center distance between the wheels is such that



they will run between the V's in the lathe bed. The upper V-block *A* swivels on the end of the screw, and the V-blocks *B* can be moved closer together or farther apart accordingly as the kinks in the work are long or short. They can also be raised by placing packing under them, so that work of different diameters can be brought nearly to the height of the centers. A wide variety of work may be handled by these adjustments.

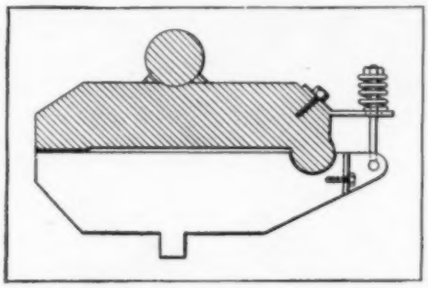



The work is revolved on the lathe centers and the high spots are marked with chalk in the usual way. The straightening device is then rolled along the lathe bed until a high spot is directly under the screw. The work is now dropped from the centers into the V-blocks and pressure is applied by the screw. The straightening is tested from time to time by raising the work from the V-blocks and supporting it in the centers, where it is revolved as before. When not in use, the device can be removed from the lathe.

## Flattening Dies for Power Brakes

FRED A. PATTERSON

In the illustration is shown a pair of flattening dies for use in a power brake. These dies have proved to be superior to the ones in ordinary use, in that they permit the pressure to be applied at the front where it is most needed. The dies always stay on an even keel and are self-opening by means of the compression of a coil spring. The round bar welded to the upper member makes it unnecessary to have the pressure plate parallel with that member. Any material having a flat surface and clamped to the ram may be used as a pressure plate to force the dies together.



We made the dies 8 in. in width to suit our work and use them on sheet iron of from 14 to 24 gage. When the shape of the work to be flattened requires wide dies, the advantage of this construction will be apparent to anyone familiar with these operations.

## A Face-Milling Cutter With an Aluminum-Alloy Body

W. L. WATERHOUSE
*Smethwick, Staffordshire, England*

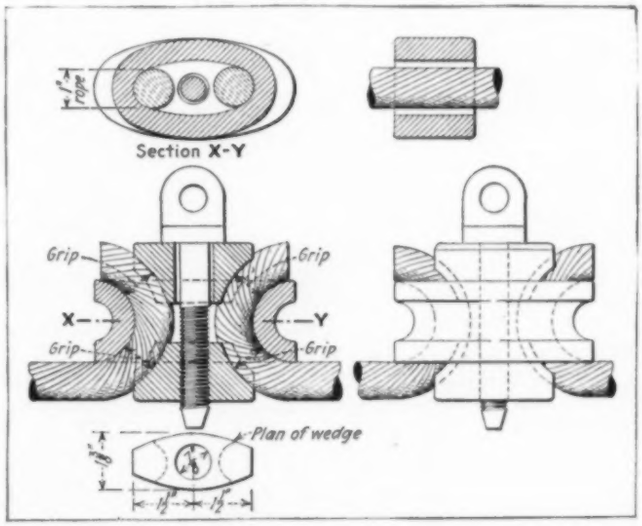
The high spindle speeds necessary when milling aluminum with face-milling cutters of large diameter cause the heavy cutter bodies to act as flywheels and make it difficult to bring the machine spindle to a stop in a reasonable length of time. The cutter shown in the illustration was designed to overcome this flywheel effect, the body being an aluminum-alloy casting, machined where marked and carefully balanced. The cutters are of round section and fit into hardened and ground bushings and are securely clamped by pad bolts made as shown above.

The small sectional view shows the method adopted to lock the cutters and prevent them from turning, two flats being milled on them against which the flats on the pad bolts fit. Provision for adjusting the cutters is by means of backing screws. The holes in the body for the bushings are bored at an angle of 20 deg. to give the necessary top rake to the cutters, the faces of which have a 15-deg. positive rake. The cutters are of high-speed steel, ground all over, and are inexpensive to replace. The bushings for the cutters and the pad bolts are of casehardening steel, hardened and ground, as are the pad bolts themselves. Alminium crankcases have been machined with cutters of this type at a feed of 16 in. per min. without any chatter, or vibration in the body resulting in a highly satisfactory smooth finish.

## A Clamp for Joining Wire Rope

J. T. TOWLSON
*London, England*

In the device illustrated, the body for the grip is in the form of a chain link. The clamp is used for gripping the ends of wire rope instead of splicing it. It can be used either for permanent or constructional work in any place where the rope is not required to pass over a sheave or through a block. The ends of the rope are given an initial curve by a piece of pipe used as a lever, the radius of the curve approximating that



of the metal in the link. The curved ends of the rope are then tucked through the link, the top and bottom wedges are placed in position, and are drawn tightly against the rope by the tightening screw, which is operated by a tommy bar.

By this simple means, the wedges are pressed into the rope and create small but powerfully resistant shoulders on four distinct parts of the curve ends. The curve ends of the rope form hooks about the link ends, which together with the bedding-in of the wedges, constitute a grip equal in strength to that of the rope itself.

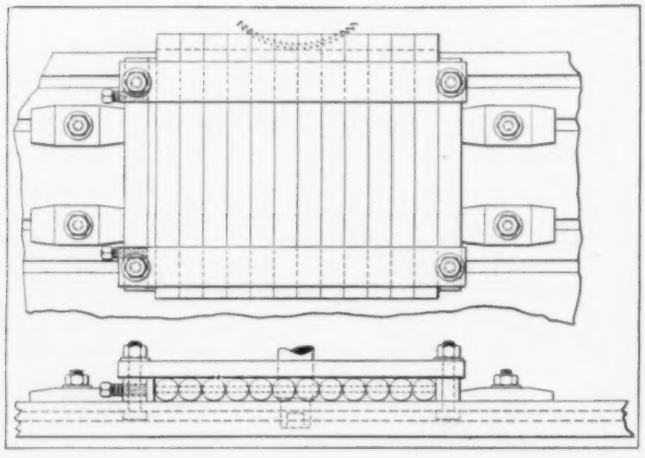
## Slotting the Ends of Shafts—*Discussion*

HENRY W. BOEHLY

In an article under the title given above (*AM*—Vol. 75, page 896), Charles Kugler describes a method of cutting slots in both ends of 1-in. shafts at one setting, upon which I wish to make a friendly comment.

Instead of making a special fixture for holding the shafts, I would use the method illustrated. The shafts are clamped on the table of the milling machine by two ordinary strap clamps resting on crossbars that are held against endwise movement by end stops. The shafts are confined by setscrews in one of the crossbars, a shoe being placed under both setscrews to prevent them from marring the first shaft. Then with a cutter held in the vertical attachment, the slots can be milled on one end at a time.

After the slots have been milled on one end of the



shafts, the shafts are unclamped and turned end for end, and a flat strip is set in the slots just milled to align them. While it is necessary to make two set-ups to slot both ends of the shafts, my scheme provides for slotting twelve shafts on one end against Mr. Kugler's scheme of slotting five shafts on both ends. Therefore, I think the production by my method will be as great by my method as by his, in spite of the fact that I have to make two set-ups to his one. The saving in machining time should more than offset the extra set-up.

If no vertical milling attachment is at hand, it will pay to buy one rather than make the special fixture, because the investment will be for a tool of universal use, while the fixture is special and can be used on one particular job only. Besides, the saving in the fixture will go a long way toward paying for the vertical attachment.

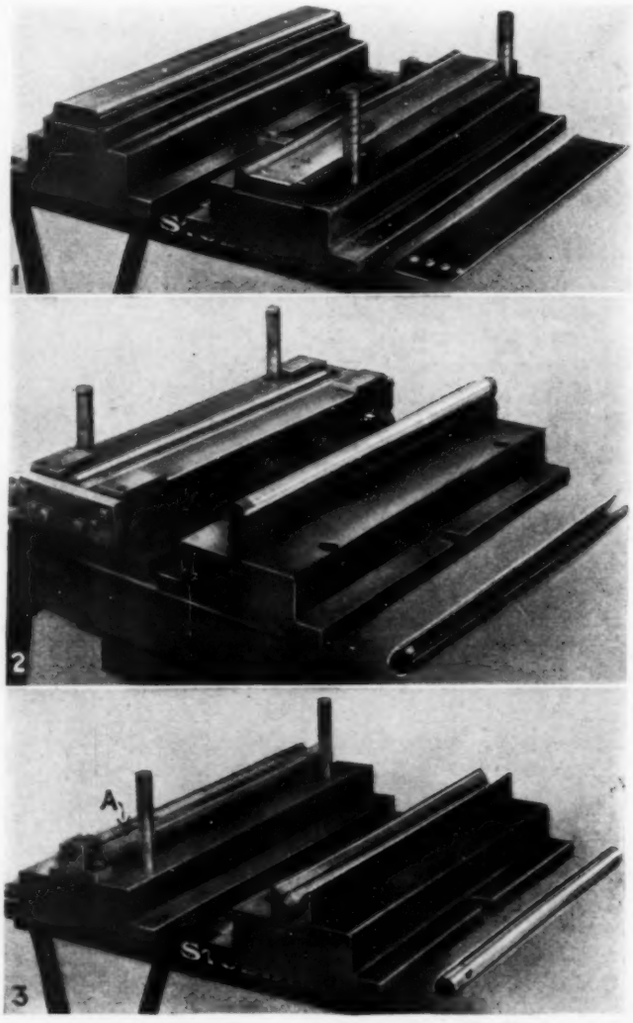
## Tube Forming in Press Dies

HERBERT F. CRAWFORD

There are several methods of forming tubes from flat strips, some of which involve rolling for the finishing operation. The method shown eliminates rolling and uses only simple dies in a punch press, no side movement of the dies being necessary.

The strip with four holes punched in one end goes to the first die, Fig. 1, where the edges are turned up as shown, the pressure pins lifting the strip clear after punching. The strip is then laid in the die at the left of Fig. 2 and the punch forms it as shown at the right. The roll in the edges carries them into the recess just below the bulb of the punch, but not enough to prevent it being easily slid off the punch endwise.

Roundness is secured by the dies in Fig. 3. The perforated end is slipped over the hinged stud at *A*, which guides the blank and the piece laid, open side up, in the lower die. The closing die at the right comes down on the open edges and forces them together, completing the tube. It will be noted that the mating edges of the dies are beveled to about 45 deg. The seam is nicely closed as can be seen by the finished tube, which can be readily welded if desired.




**Above are shown the tools for forming tubes from strip steel. The pieces to the right give the progressive stages of manufacture**

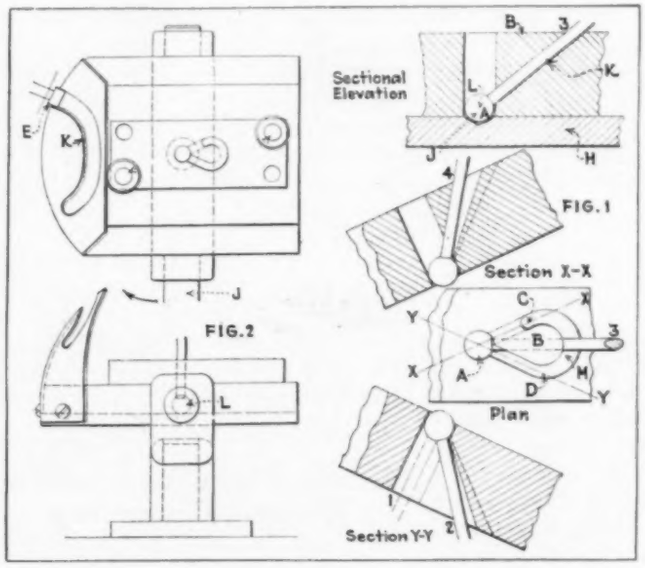
## Milling a Peculiar Slot

HARRY SHAW
*Tool & Gear Consultant,*
*Heywood, Lancashire, England*

In a certain textile machine it was necessary to mill some slots of the form shown in Fig. 1, to enable a thread of cotton (as used in the canvas of motor tires) to enter at *A* and then be hooked under the part *B* so that it will come away at *C* and yet not slip out at *D*. *B* in the sectional elevation is a section through the metal *B* in the plan. The usual arrangement employed a single hole through which the yarn had to be threaded, taking up considerable time; or a separate hook, which entailed a more expensive construction.

The hole *A* is drilled in the usual way. The work is now placed on the plate *H* having a conical recess into which the ball *J* at the end of the cutter fits. The cutter and the ball are inserted in the hole *E* in the position shown at *1* in the section *Y-Y*. By tilting the plate *E* around *L*, the center of the ball, so that the center line of the cutter keeps in the plane *Y-Y*, the work is caused to move so that the cutter occupies the relative position *2*, and the slot *D* is formed. Then by a combined tilting and turning movement, still moving around *L* as a center, the slot *D-M-C* is formed, the cutter finally occupying the position *4* shown in the section *X-X*. During cutting, the forces tend to press the ball into the conical recess in the plate *H*, so steadying the cut.

For giving the work the necessary motions for milling




the slot, the fixture shown in Fig. *2* is used. The work is located from two diagonally opposite holes on pegs in the fixture, and is clamped by two knurled nuts. When the fixture is turned in the direction indicated by the arrow, by pressure applied to a lever attached to the shaft *J*, the cam *K* being in contact with the roller *E* fixed to the table of the machine, causes the table of the fixture to turn about the center *L* the required amount.

Thus the shape of the slot is controlled automatically. The operator must, however, turn the table slightly about the horizontal axis when starting on a fresh piece, as the cam slot for the first part of the slot in the work is at right angles to the direction of pressure from the lever fixed to the shaft *C*, and so no turning motion could obtain from this pressure only. The cam slot is formed in a piece of plate peened roughly to a spherical shape. A high cutter speed is used, and the cutter is of helical form.

How would other readers tackle the same job?

# SEEN AND HEARD

JOHN R. GODFREY

### Scrapping a Salvage Department

Salvaging worn parts of machines is more of a problem than may appear on the surface. A number of years ago, I visited a railroad shop that boasted an extensive salvaging department. Old bolts, brake rods, car truss rods, axles and the like were carefully gone over, sorted and refinished in many ways. The department was pointed to with pride by the management.

The other day I revisited the same plant to find that the salvaging department was now a thing of the past. The only sorting, after parts had been discarded, was to classify the kind of scrap. The economy of the former method was seriously doubted, and even the axles were not reworked except in special cases. I recall when they made milling cutters of them, case-hardened them, and deluded themselves into thinking that they were saving money. Discarding the salvaging department was a real sign of progress in this case.

### Exchanging Information

Railroads, with few exceptions, give out information as to shop practices freely, although it is the policy in many cases, to request that the source of the information not be divulged. The reason for this is not always clear unless it is to avoid criticism if the methods are not approved. But once in awhile you find a shop official, who does not want to tell even other railroad men about his particular methods, which is even more difficult to explain.

Railroads are so much in the same boat of facing ever increasing competition from various sources that it would seem good policy to help each other to the limit. No one needs to reduce maintenance and operating costs more than they, and there should be no hesitance in helping each other on all occasions.

### Giants and Midgets

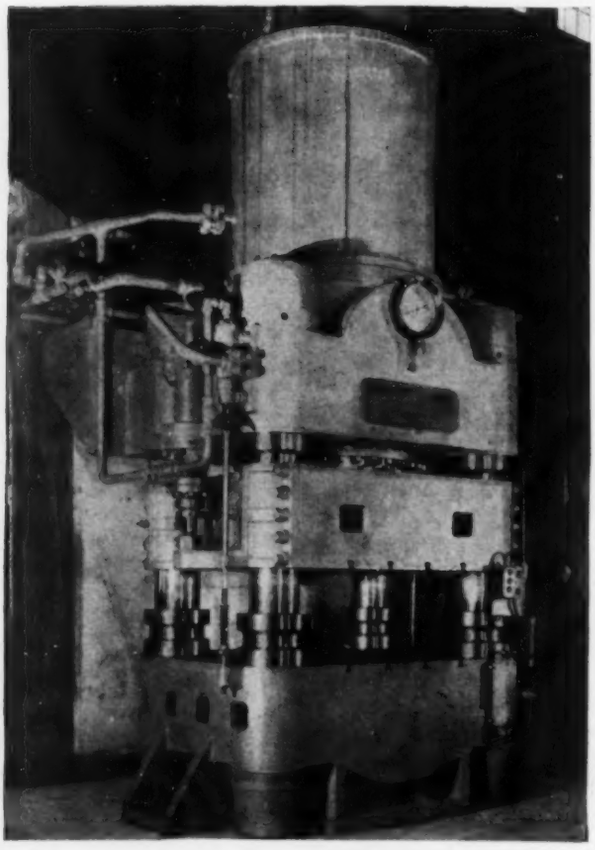
Watches have always symbolized to me the approach to mechanical perfection, and I still remember the thrill of achievement and the anterior sting that culminated a successful effort to get one apart. The heart of a watch is the hairspring. Hairsprings develop rust, and in addition must fight magnetization and temperature variations, all three of which impair accuracy. Dr. Charles Edouard Guillaume, great European physicist and head of the International Bureau of Weights and Measures, thinking about hairsprings, developed a new alloy—Elinvar. It won for him the Nobel Prize, and made the use of a compensating balance wheel unnecessary, for Elinvar is non-magnetic, practically immune to corrosion, and maintains its elasticity despite temperature variations.

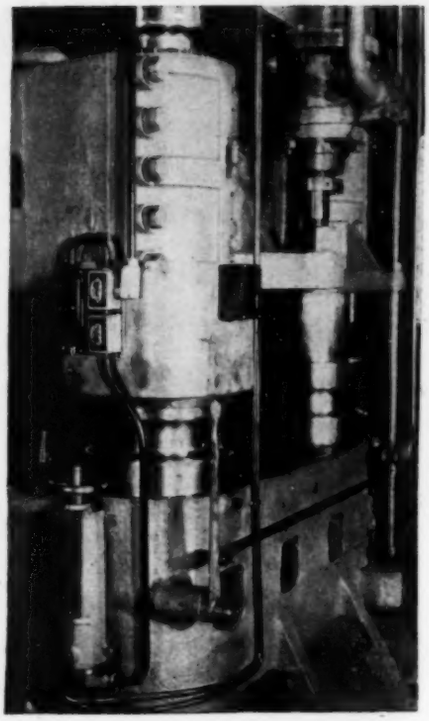
# SHOP EQUIPMENT NEWS

## "H-P-M" Improved "Hydro-Power" Platen Presses

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has announced further improvements in its line of "Hydro-Power" platen presses for metal stamping operations, such as deep drawing, forming, blanking, bending, coining, embossing, punching and straightening. The presses are available in eleven pressure capacities from 100 to 2,000 tons, each in three square platen sizes ranging in 12 in. increments from 24x24 to 72x72; also in the openside type, the sizes in this type being from 36x24 to 84x60 in.

These presses are operated by the oil pressure "Fastraverse" system, which gives rapid ram travel to the work, a slower pressing speed, and rapid return of the ram. There are three methods of operation provided with the press, the changeover from one to the other being made without stopping the press. The changeover is effected by two small two-way electric switches. These methods are full automatic, semi-automatic and manual. Full automatic operation causes the complete cycle to repeat itself continuously as long as power is available. Semi-automatic operation completes only one cycle, with the ram remaining in the upper position. Tripping an electric pushbutton releases the rim, bringing it quickly into contact with the work, developing the pressure required and returning the ram to its starting point. With manual operation every movement of the ram is controlled by the operator. To bring the ram forward a single hand lever is moved in the same direction. After pressure is applied the same lever is used to return the ram. One of the recent improvements is that a centralized position to which the lever can be moved is known as neutral. By shifting the lever to this point, the ram can be held at any position within the distance of the ram travel. Speed of ram travel in either direction is proportional to the distance the hand lever is placed from neutral.



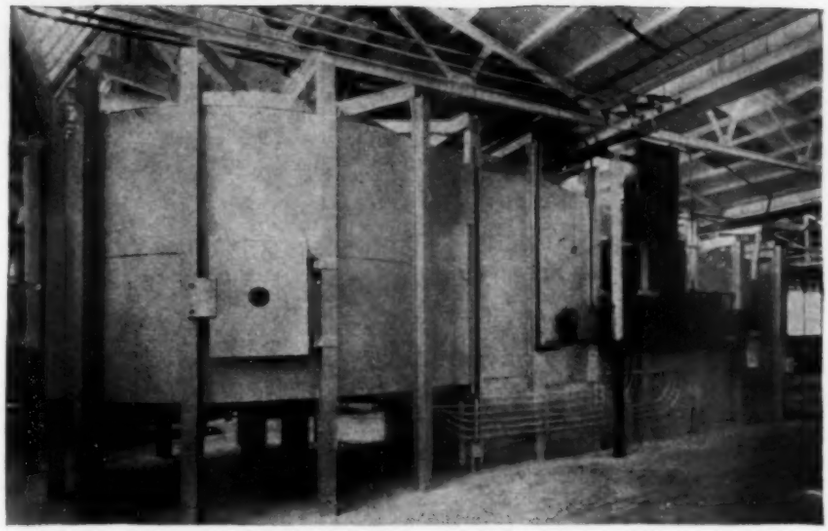


**Close-up of the control for three methods of operation**

The platen press is protected from overstroke by means of full pressure stops attached to the strain rods. The power consumption when the press is idle is practically zero. Only sufficient pressure is maintained to balance the weight of the press ram and platen. To conserve space, the radial pump power unit and its electric motor drive are mounted on the press head directly behind the main cylinder. The pressing fluid is also held in an overhead tank.

## Westinghouse Continuous Electric Enameling Furnace

A continuous electric enameling furnace, rated at about 1,500 sq.ft. of sheet ware per hour, has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This furnace is approximately 40 ft. long over-all, and is designed to operate at a chain speed of 4 to 5 ft. per min. The majority of installations made to date have been designed for relatively large production equivalent to the output of about four to five box furnaces. Such designs have not been suitable for many plants having a production



**Westinghouse Small Continuous Electric Enameling Furnace being used for annealing and burning off refrigerator evaporators**

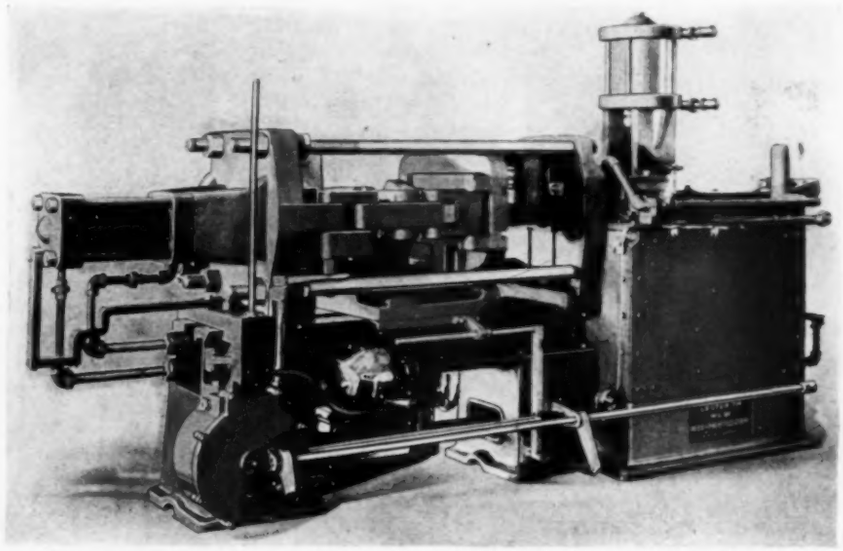
equivalent to about two box furnaces, and consequently the investment in continuous furnaces of the heretofore larger sizes has not been justified. The furnace illustrated, however, makes it possible for the smaller porcelain enameling plants to take advantage of continuous operation.

## Lester Die-Casting Machine

A hydraulically operated, pressure-type die-casting machine, designed for producing white-metal castings, has been developed by the Lester Die & Machine Co., Cleveland. It is being manufactured and distributed by the Reed-Prentice Corp., Worcester, Mass. The machine has a capacity of 150 to 450 shots per hour, depending on the size of the casting. Die space ranges from 6 to 17 in. The locking pressure is 120,000 lb. This pressure, combined with the fact that the metal is forced into the mold at the exact pressure required to expel the air, results in a casting free from blowholes and with a smooth surface finish. Because of the high pressure with which the metal is forced into the mold, a lower casting temperature —from 800 to 820 deg. F.—is possible. The pot temperature is thermostatically controlled.

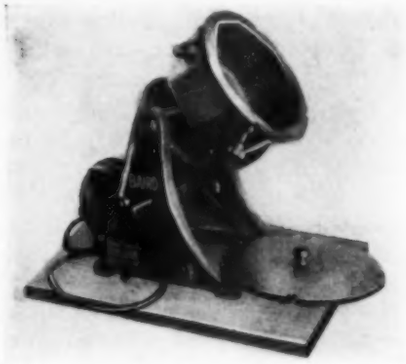
The machine can be run at seven speeds accomplished by change gears. The motor is of the constant-speed type and is of 4-hp. capacity. Die changes are comparatively simple, adjustment of the four tie bars being the only operation necessary.

The machine is 10 ft. 8 in. long, 50 in. high, 42 in. wide, and has a shipping weight of 6,500 lb.



## Baird Bench-Type Oblique Tilting Tumblers

Small quantities of work can be tumbled in the belt- or motor-driven types of oblique tiliting tumblers announced by The Baird Machine Co., Bridgeport, Conn. The size of the machine allows it to be mounted on a bench, and it can be used for various processes of tumbling, including ball burnishing. The barrel shown is made of cast metal, but barrels can be furnished of different materials, shapes and sizes to suit the work. More than one barrel can be used on one tumbler.

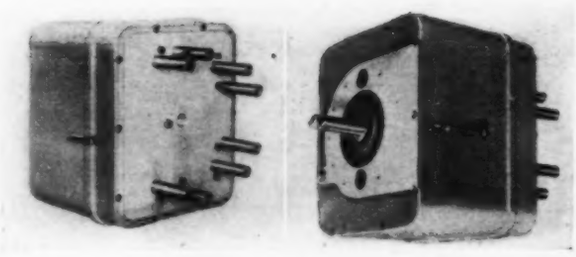


The barrel is held by a simple notched segment and locking bar arrangement. It can rotate in any one of eight angles from a vertical position to 20 deg. below horizontal. Shafts are bronze-bushed and automatically oiled, and the bevel gears run in a bath of oil. The net weight with barrel and motor is 130 lb. Capacity of the barrel is 2 to 3 qts.

## Miami Multiple-Spindle Drillhead

An adjustable fixed-center drillhead has been developed by The Miami Engineering Co., Commerce Bldg., Fourth & Wells St., Milwaukee, Wis. The drillhead employs a new principle in gear arrangement to give positive drive, but permits changing spindle locations for various drilling jobs. The main gearbox is never changed or altered. In chang-

ing from one job to another the screws retaining the removable plate and spindles are removed and the spindles slipped into the new plate, which is bolted in place, after which the machine is ready for the new job.



Miami Adjustable Fixed-Center Drillheads

Any number of spindles can be driven in one head at any location, limited only by the size of the head. Minimum spindle center distance is equal to the diameter of the spindle plus $\frac{1}{16}$ in. Spindle speeds can be changed from one set-up to another without altering the gearbox. Speeds up to 5,000 r.p.m. for small-size drills can be obtained by a separate spindle assembly. Drill adjustment is made in the spindle nose by means of a sliding sleeve backed up by a threaded collar and retained by a setscrew. Removable plates for tapping work carry individual leadscrews fo reach spindle. Bearings can be either ball, roller or bronze.

The drillhead can be furnished in any shape or contour desired for vertical drilling machines, horizontal drilling machines and tapping machines.

## Zeiss Gear Testing Machine

A Zeiss gear tester for accurate gears is being introduced into the United States by the George Scherr Co., Inc., 128 Lafayette St., New York, N. Y. Measuring precision to 0.0001 in. combined with rapid operation, easy-to-read indication of the result, and versatility are features of the instrument. Although capable of a wide working range, the instrument is compact enough to be readily portable. The gear tester will take spur, bevel, helical, and worm gears and test the following elements: circular pitch, eccentricity, uniformity of tooth spaces, and uniformity of tooth thickness.

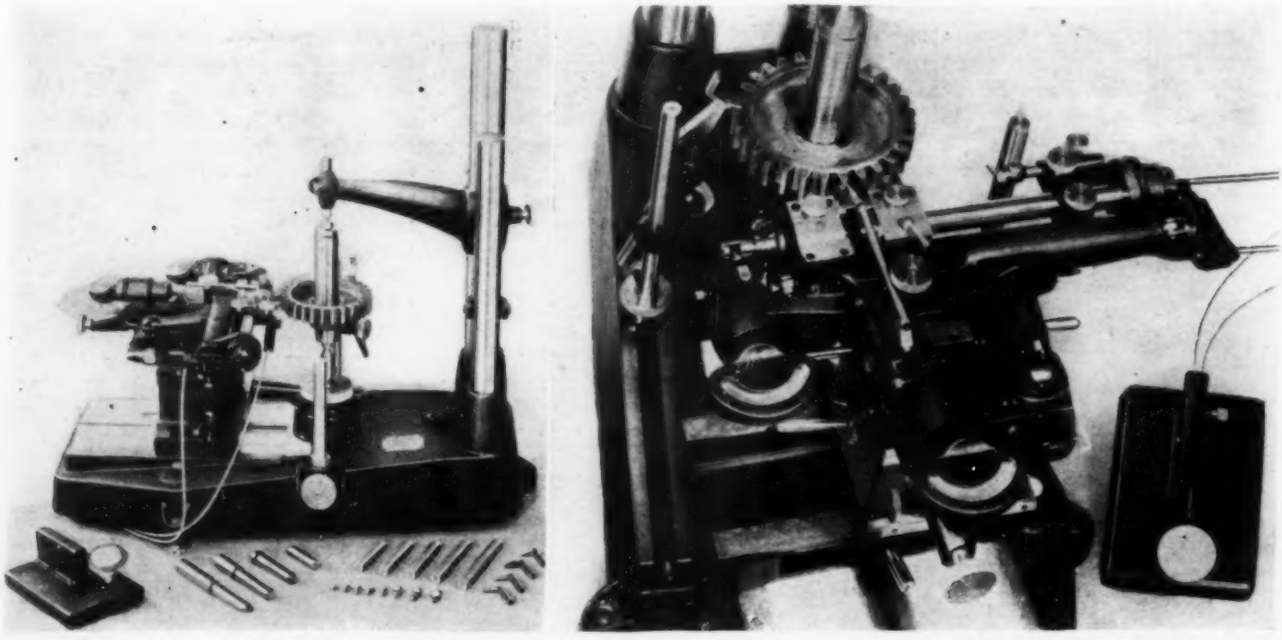
The machine comprises a heavy base with an upright column, on which a slidable bracket carries a center vertically above a corresponding center on the base. The gear is placed between centers, where it can be revolved to bring successive teeth into position. Opposite this column on the forward end of the base is the measuring slide, which is carried on a compound rest, permitting rough adjustment in two directions. The slide carries the contact blades, which engage the gear teeth.

The measuring process consists in contacting the measuring blades tangentially with the sides of the teeth. Since the two blades are parallel while the tooth flanks are equidistant curves, it is immaterial at what exact point the blades engage the teeth.

Arranged on the side of the measuring slide away from the blades are two precision indicators, one for peripheral and one for radial measurement. The measuring slide is movable toward and from the work by action of a spring. As soon as a measurement has been made, the slide may be pulled back, and the gear turned to the next location.

In measuring bevel gears, an auxiliary segment bed carrying a circular slide with diametrically opposite centers is placed between the main centers. The gear is put between centers in the circular slide, which is set at the angle required to bring the tooth to be examined vertically in line in front of the measuring slide. Helical and worm gears are also measured in this attachment.

In setting up for measuring circular pitch, the blades are set by the help of gage blocks to the theoretical chordal distance. The slide is roughly adjusted to where the two contact blades are tangential to the tooth flanks, and the left-hand indicator set

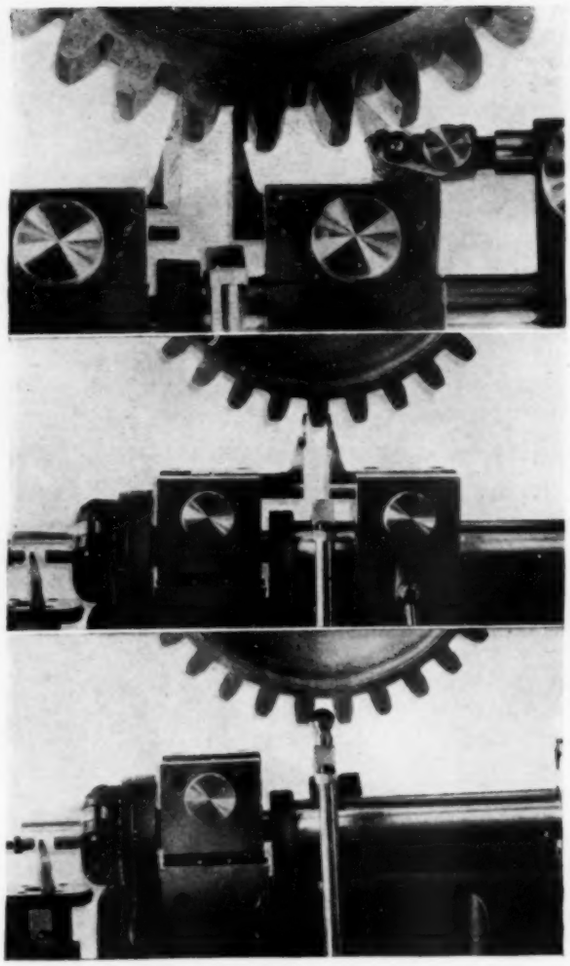


Left—Side view of Zeiss Gear Testing Machine for accurate gears. Right—Looking down on the slide and toward the gear. Application of the blades to the tooth flanks is effected by spring action, independent of skill of the operator

to zero. Application of the contact blades to corresponding flanks of successive pairs or groups of teeth constitutes the measurement. Deviation of the measurement from the nominal value is transmitted by a lever system to the index hand, which registers the error in ten-thousandths of an inch. The contact blades may also be spaced and the instrument set to zero from any pair or set of teeth which is assumed to be correct. Successive measurements may then be compared with this hypothetically correct distance, and the degree of uniformity of the tooth spacing thus ascertained.

Eccentricity is measured by a ball-tipped radial spring plunger. Variation of the radial distances by which the plunger enters the tooth spaces is registered by a second indicator to ten-thousandths of an inch.

The thickness of teeth is measured by the application of straddling ball-tipped feelers applied to the flanks of a single tooth, as measured at the pitch circle. The results obtained are composed of the eccentric error in combination with errors in the tooth thickness, and the resultant curve will indicate the degree of uniformity in the tooth thickness.



**Top—Testing circular pitch to 0.0001 in. on the Zeiss Gear Testing Machine. Center—Testing uniformity of tooth thickness. Bottom—Measuring eccentricity with a ball-tipped plunger**

## Gardner Improved "Wire Lokt" Abrasive Disk

Three advantages to the users of "Wire Lokt" abrasive disks are pointed out by the Gardner Machine Co., Beloit, Wis. These three advantages are: the abrasive disks eliminate any cement set-up in the user's plant; there is no backing to be returned for resurfacing, and attachment of the wheel to the steel disk wheel is made simply by fillister-head screws.

A heavy steel wire mesh is embedded in the abrasive structure, as shown in the accompanying illustration, and forms a part of the abrasive backing. Steel anchoring nuts are locked in the wire mesh, and the plastic abrasive is forced through the mesh and around the nuts, so that the mesh and nuts are firmly locked by the hardening of the abrasive bond. Fillister-head screws, $\frac{3}{8}$ in. in diameter, pass through the steel disk wheel and enter the anchoring nuts in the backing in all cases, except in 53- and 72-in. sectional disks. In these sizes, cored holes are provided in the face of the abrasive itself, and the screws enter the steel wheel from the face of the grinding member. This method of application eliminates the necessity for removing a large, heavy steel wheel from the machine spindle during the mounting operation.

The Wire-Lokt abrasive disks are normally built with 1 in. of usable abrasive. These disks are supplied in all standard diameters, and with standard center holes only.

## O. K. Stellite Milling Cutters

Milling cutters with either Stellite or Stellite J-Metal blades are now available from the O. K. Tool Co., Shelton, Conn. The Stellite cutter blade has been designed to retain the essential features of the O.K. serrated cutter blade, but is of suitable construction for the difference in material. The Stellite blade is backed by an adjustable wedge interlocking with it by mating grooves and positively locking in the body. By changing the position of the grooves of the wedge and blade, the blade may be adjusted either axially or radially, or both, in the cutter. This allows for wear both on the outside diameter and the face. When the blade and adjustable wedge are assembled together, they are interchangeable with any corresponding slot of O.K. cutters.

The cutter bodies are of chrome-nickel steel, drop-forged and heat-treated. The cutter can be refitted with a new set of blades. The line includes face mills, special drive face mills and end mills.

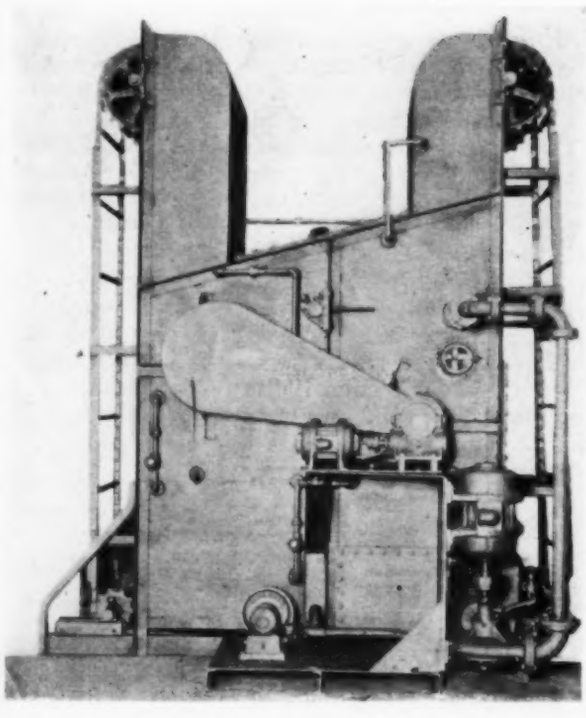
## "Rex" Vertical Solvent Washing Machine

For use where floor space is limited, the Rex Products & Mfg. Co., 13005 Hillview Ave., Detroit, Mich., has developed a vertical solvent washing machine. This machine may be operated by one person, who is able to place the dirty work upon the conveyor, or fixtures, and then remove the clean work, which may be returned to him.

The cleaning solvent used in this machine is known as "Perm-A-Clor," which is non-explosive, non-inflammable, and acid-free in both liquid and vapor form. The work is placed on a conveyor, with or without fixtures, at the right side of the machine, and then passes downward into the machine between powerful streams of boiling solvent, which strike the work at all directions at a pressure of 35 lb. per sq.in. The work and conveyor then pass upward, permitting the work to drain. Next the work passes through a rinse of distilled, hot solvent, after which it passes upward and leaves the machine clean and dry. The work may be removed from the conveyor at the left of the machine or passed under the machine and returned to the operator for removal.

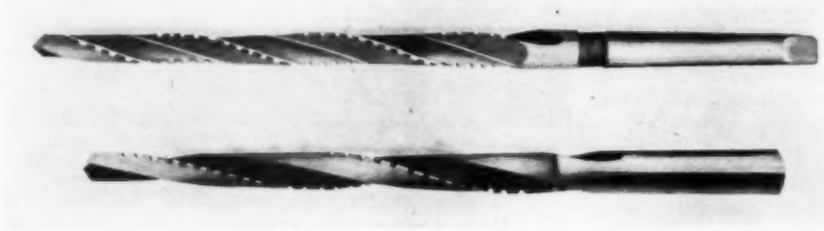
After the solvent in the pumping chamber has been contaminated with an accumulation of oil and foreign matter, the flow-back pipe from the rinsing chamber is shut off and the distilled solvent is drawn off into a reserve tank, until all of the solvent in the pumping chamber has been distilled or evaporated, leaving only a sludge in the pumping chamber. This sludge is removed and the clean distilled solvent is drained back into the pumping chamber. Condensers at the openings in the machine keep the loss of solvent at a minimum.

The process is most suitable for cleaning zinc or lead-coated metals, aluminum die castings or soft metals which are affected by ordinary alkali cleaners, as well as removing lubricating oils from machined, stamped or quenched parts, removing buffing compounds, or removing contamination on parts before painting, lacquering, enameling, plating, vitreous enameling or other surface coating. The machines are designed and adapted for any particular kind or class of work.



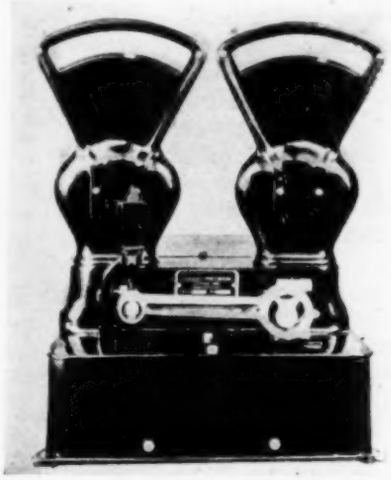
## "Brocko" Taper Reamer Drills

Taper pin holes and Morse taper holes in toolholders and machine spindles can be secured in one operation with the "Brocko" taper reamer drill announced by A. C. Bellefleur & Son Co., 136 Garfield Ave., New London, Conn. It is said a No. 4 taper hole can be drilled through 1¼-in. cold rolled steel in one minute. The drills are made in both tapered and straight shank types for all standard taper pin sizes and Morse sizes.

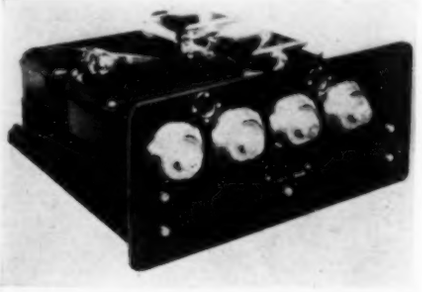


## Toledo Connecting-Rod Testing Auto-Gage

Toledo Precision Devices, Inc., subsidiary of the Toledo Scale Co., Toledo, Ohio, has developed a connecting-rod testing "Auto-Gage," which consists of two separate machines. One of them performs the initial weighing of the connecting rod. Contrary to usual practice, each end of the connecting rod is weighed at the same time. Both ends of the rod are attached to two instruments mounted side by side and two charts register simultaneously the amount of overweight in each end of the rod.



After the amount of overweight has been ascertained, the operator sets the dials of the machine illustrated in above to coincide with the figures on the charts. This machine consists of two instruments with receiving pans. An automatic cut-off device is connected with a shaving machine placed next to it. The con-



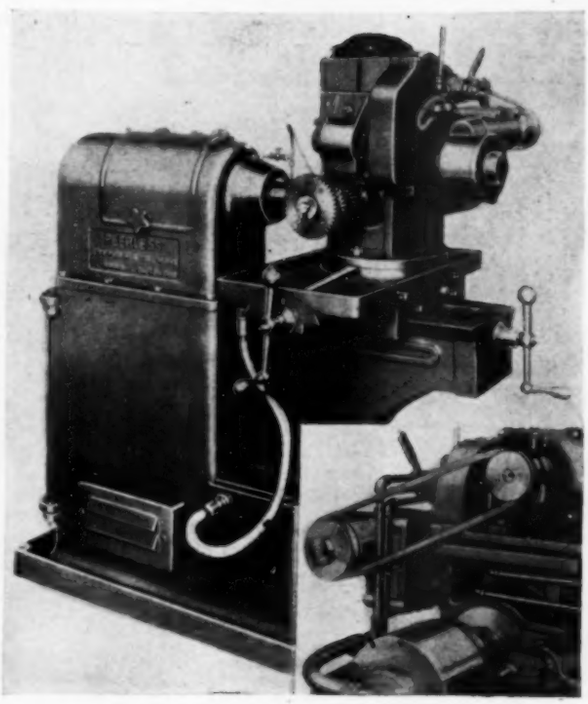
necting rod is placed in the shaving machine and pared to the proper diameter, at which point the automatic cut-off stops the operation. Both ends of the connecting rod are shaved at the same time. One man can operate both machines.

## O. K. Square Toolbits

Square toolbits with the metallurgical features of its regular line of inserted-blade cutters are now available from the O. K. Tool Co., Shelton, Conn. The bits are ground to size and will fit any make of square-bit toolholders and they may also be used in the toolholders of turret lathes. There is a variation of but two points in the range of carbon in the steel used—between 68 and 70. The toolbits are drop-forged. Sheet No. 1A-6, describing the line, is available.

## Workhead Drive for Peerless Model 3 Chamfering Machine

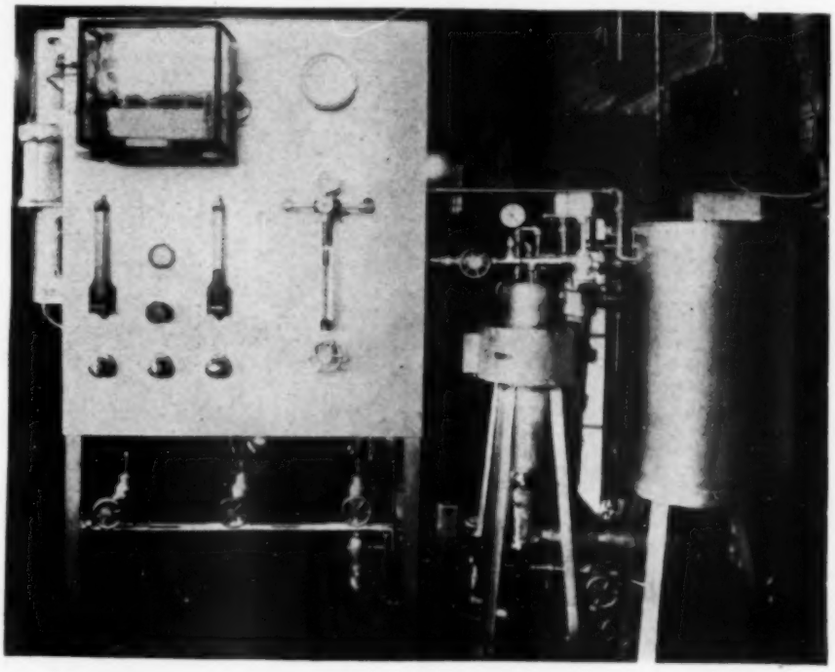
As an optional feature at slight additional cost, the City Machine & Tool Works, East Third at June Sts., Dayton, Ohio, has developed a new workhead drive for the Model 3 Peerless chamfering machine. Instead of utilizing a combination geared-head reduction motor, this drive separates the reduction unit and the motor, and permits the use of a standard motor to drive the reduction unit by means of V-belts. An additional advantage is obtained in that this drive enables changing the operating speed of the workhead to secure maximum results for each individual type of operation, rather than setting the machine workhead to one given operating speed. Standard motors can be employed and flexibility in change of feeds and speeds can be obtained. The illustration shows a full view of the machine set up for chamfering a small gear on a cluster. The insert shows a close-up from the rear of both the motor and gear reduction unit.



## Westinghouse Ammonia Dissociator

Equipment for dissociating liquid anhydrous ammonia has been announced by the Westinghouse Electric & Mfg. Co., Mansfield, Ohio. This equipment is available in three standard sizes, the capacities of which are 50, 250 and 600 cu.ft. per hr. It is simple to operate, being practically automatic.

Dissociation of anhydrous liquid ammonia gives 75 per cent hydrogen and 25 per cent nitrogen by volume. The dissociator is designed so that when it is operated at rated capacity the dissociation is about 99.5 per cent. It is thus free from excessive quantities of raw ammonia and moisture. Each pound of liquid ammonia yields 45 cu.ft. of dissociated gas. The ammonia can be obtained in tank car lots at approximately $0.06 per lb., or in 100-lb. cylinders at approximately $0.16 per lb. Based on the cost of operating the dissociator, with a power rate of $0.01 per kw.-hr., the cost of dissociated gas is approximately $3.75 per thousand cu.ft. If the liquid ammonia is purchased in tank car lots, the cost of dissociated gas is approximately $1.60 per thousand cu.ft.

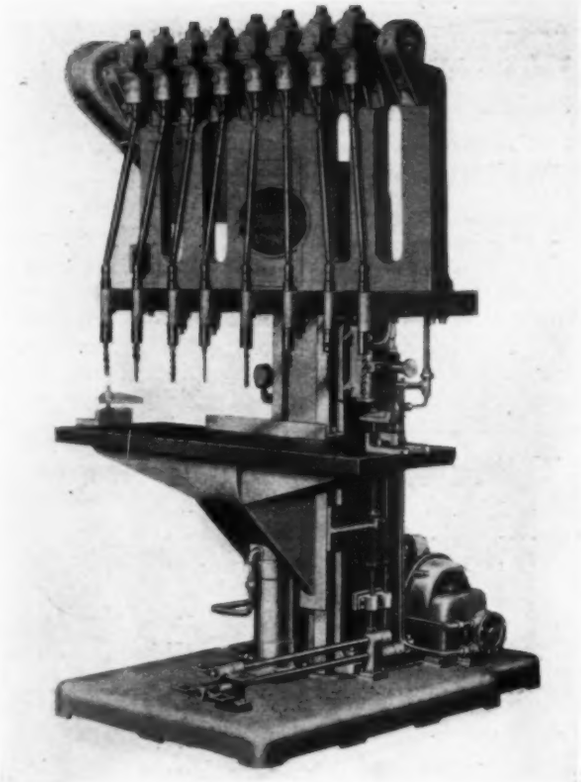


## Root Style "CH" Hydraulic-Feed Boring Machine

Although developed principally for the woodworking industry, the Style "CH" boring machine, announced by the B. M. Root Co., York, Pa., has a flexible hydraulic feed that makes it suitable for drilling and tapping small holes in panels of metal, composition and high-density fiber board. Adaptations of this machine in metal-working plants have included

drilling metal parts of automobile, windshields and drilling metal moldings for automobile bodies. This machine is built in four lengths, 3, 4, 5 and 6 ft., and each machine has a front-to-back spindle adjustment of 12 in.

The hydraulic feed provides automatic continuous or intermittent strokes. Two treadles control the operation of the machine. The front and lower treadle gives stop and start positions, and the upper and rear treadle gives up and down movement for the feed for the hydraulically operated table. The 3-ft. machine will accommodate up to 11 spindles, and the 6-ft. machine, 22 spindles. Spindle speeds are 1,800 r.p.m. The speeds can be altered to suit conditions. Tapping speeds up to 2,300 r.p.m. are available and give almost instantaneous tapping. In connection with tapping, the chief feature is that there is no radial float in the tapping head and the spindle and tap holder are of small size and low weight so that inertia effects are minimized. A constant-speed, repulsion-induction motor drives the spindles.



**Drilling and tapping large metal parts can be done on this Root Hydraulic-Feed Machine**

## • PATENTS •

JANUARY 19, 1932

**Metal-Working Machinery**

Roller Bearing Grinder. Charles Edwin Rife, Baltimore, Md. Patent 1,841,631.

Grinding Machine. Roger N. Heald, Edward M. Taylor, Ralph A. Quimby, and Carle J. Highberg, Worcester, Mass., assigned to The Heald Machine Co. Patent 1,841,809.

Machine for Grinding the Teeth of Gear Wheels and for Other Like Purposes. John Wildsmith Snarry, Birmingham, England, assigned to The Gear Grinding Co., Ltd., Birmingham, England. Patent 1,841,852.

Automatic Lathe. Edwin R. Smith and Albert Schinkez, Seneca Falls, N. Y., assigned to Seneca Falls Machine Co. Patent 1,841,988.

Machine Tool Driven by an Electric Motor. Wilhelm Brasch, Frankfort-on-the-Main, Germany. Patent 1,842,009.

Machine for Shearing Metal and Other Sheets. Jean Achard, Paris, France, assigned to Société Anonyme des Anciens Etablissements Achard & Cie., Paris, France. Patent 1,842,229.

**Tools and Attachments**

Chuck. John A. Thatcher, Somerville, Mass. Patent 1,841,460.

Automatic Drill Head. William K. Millholland, Indianapolis, Ind. Patent 1,841,546.

Chuck for Bracing of Tools, Work-Pieces or the Like. Per Sederholm, Stockholm, Sweden, assigned to Stickler & Magnuson Aktiebolag, Stockholm, Sweden. Patent 1,841,919.

Tailstock. Ernest R. Llewellyn, Arlington, Mass., assigned to The Hendey Machine Co. Patent 1,842,035.

Feed Collet. John Milton Luers, Detroit, Mich. Patent 1,842,036.

Self Oiling Leader Pins for Die Sets. William T. Clark, Milwaukee, Wis. Patent 1,842,071.

**Processes**

Method of Sheet Metal Stamping. Carl Kirchner, Carthage, Mo., assigned to The Leggett & Platt Spring Bed & Manufacturing Co. Patent 1,841,820.

Method and Apparatus for Forming Individual Shapes. (Forging). John W. Smith, Philadelphia, Pa. Patent 1,841,920.

Process and Apparatus for Treating Steel. (Salt Bath.) Horace C. Knerr, Germantown, Philadelphia, Pa., assigned to Ajax Electrothermic Corp. Patent 1,842,272.

## • TRADE PUBLICATIONS •

ALUMINUM AND ITS ALLOYS. The Aluminum Co. of America, Pittsburgh, Pa., has issued a book entitled "Alcoa Aluminum and Its Alloys," which is a ready reference book, giving in concise form information concerning the physical and chemical properties of the aluminum alloys produced. In addition, the book contains tables showing the sizes of basic commodities manufactured from the alloys and also the commercial tolerances.

CAUSES OF BUSINESS FAILURES. The U. S. Department of Commerce, Bureau of Foreign & Domestic Commerce, has issued a booklet "Causes of Business Failures and Bankruptcies of Individuals in New Jersey in 1929-30." The analysis gives the cause of failure as poor business methods and practices as the principal reason. Copies are available from the Superintendent of Documents, Washington, D. C., for $0.10.

MOTORS. The Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo., has issued Bulletin 167, Part 7, on squirrel-cage motors of polyphase design.

REBUILT MACHINE TOOLS. The Simmons Machine Tool Corp., Albany, N. Y., has issued a catalog of its rebuilt machinery in stock. Photographs and prices are listed.

STAINLESS STEEL. The American Stainless Steel Co., Commonwealth Bldg., Pittsburgh, Pa., has issued a booklet "Forward with Stainless," giving the properties of the metal, and particularly its value to the metal product designer, the fabricator, and its value for various types of equipment.

THREADLOCKING DEVICES. The U. S. Department of Commerce, Bureau of Standards, has issued Research Paper No. 386 entitled "The Relation of Torque to Tension for Threadlocking Devices." Only about one-quarter of the 41 devices tested showed any appreciable difference in static torque-tension relation from that of the American National coarse-thread standard nut. This quarter included special permanent-set nuts and the Dardelet thread. The booklet is for sale by the Superintendent of Document, Washington, D. C., for $0.30.

*The Hoover Sphere.* The Hoover Steel Ball Co., Ann Arbor, Mich., published its first issue of *"The Hoover Sphere"* as of January, 1932. This monthly publication gives some good general human interest copy and also contains educational articles regarding the manufacture of balls and bearings, and also regarding the service of the company. Business executives or engineers will be placed on the mailing list upon application.

American Machinist

Reference Book Sheet

# PRESS AND SHRINK FITS ON TAPERS

| Size of Hole Inches | Allowance for Press Fits, Inches | Taper Per Foot of Length, Inches | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3/16 | 1/8 | 3/16 | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 1 | 1 1/4 | 1 1/2 | 2 | 2 1/2 | 3 |
| 1 | 0.002 | 0.384 | 0.192 | 0.128 | 0.096 | 0.064 | 0.048 | 0.040 | 0.032 | 0.024 | 0.020 | 0.016 | 0.012 | 0.010 | 0.008 |
| | | 25/64 | 3/16+ | 1/8+ | 3/32+ | 1/16+ | 3/64+ | 3/64− | 1/32+ | ..... | ..... | 1/64+ | 1/64− | 1/64− | ..... |
| 2 | 0.004 | 0.768 | 0.384 | 0.256 | 0.192 | 0.128 | 0.096 | 0.080 | 0.064 | 0.048 | 0.040 | 0.032 | 0.024 | 0.020 | 0.016 |
| | | 49/64+ | 25/64− | 1/4+ | 3/16+ | 1/8+ | 3/32+ | 5/64+ | 1/16+ | 3/64+ | 3/64− | 1/32+ | 1/32− | 1/64+ | 1/64+ |
| 3 | 0.0055 | 1.056 | 0.528 | 0.352 | 0.264 | 0.176 | 0.132 | 0.110 | 0.088 | 0.066 | 0.055 | 0.044 | 0.033 | 0.027 | 0.022 |
| | | 1 3/16 | 17/32− | 23/64− | 17/64− | 11/64+ | 1/8+ | 7/64+ | 3/32− | 1/16+ | 1/16− | 1/64− | 1/32+ | 1/32− | 1/64+ |
| 4 | 0.007 | 1.344 | 0.672 | 0.448 | 0.336 | 0.224 | 0.168 | 0.140 | 0.112 | 0.084 | 0.070 | 0.056 | 0.042 | 0.035 | 0.028 |
| | | 1 11/32 | 43/64 | 29/64− | 21/64+ | 7/32+ | 11/64− | 9/64 | 7/64+ | 5/64+ | 5/64− | 1/16− | 3/64− | 1/32+ | 1/32− |
| 5 | 0.008 | 1.536 | 0.768 | 0.512 | 0.382 | 0.256 | 0.192 | 0.163 | 0.128 | 0.096 | 0.081+ | 0.064 | 0.048 | 0.041 | 0.032 |
| | | 1 17/32+ | 49/64+ | 33/64− | 25/64− | 1/4+ | 3/16+ | 11/64− | 1/8+ | 3/32+ | 5/64+ | 1/8+ | 3/64+ | 3/64− | 1/32+ |
| 6 | 0.009 | 1.728 | 0.864 | 0.576 | 0.432 | 0.288 | 0.216 | 0.180 | 0.144 | 0.108 | 0.090 | 0.072 | 0.054 | 0.045 | 0.036 |
| | | 1 47/64+ | 55/64+ | 37/64 | 7/16− | 9/32+ | 7/32− | 5/16− | 9/64+ | 7/64+ | 3/32− | 5/64− | 3/64+ | 3/64− | 1/32+ |
| 7 | 0.010 | 1.920 | 0.960 | 0.640 | 0.480 | 0.320 | 0.240 | 0.200 | 0.170 | 0.120 | 0.100 | 0.085 | 0.060 | 0.050 | 0.043 |
| | | 1 59/64 | 61/64+ | 41/64 | 31/64− | 21/64− | 15/64+ | 13/64+ | 11/64− | 1/8+ | 3/32+ | 3/32− | 1/16− | 1/64+ | 1/64− |
| 8 | 0.011 | 2.112 | 1.056 | 0.704 | 0.528 | 0.352 | 0.264 | 0.220 | 0.176 | 0.132 | 0.110 | 0.088 | 0.064 | 0.055 | 0.044 |
| | | 2 7/64+ | 1 1/16− | 45/64 | 17/32− | 23/64− | 17/64 | 7/32+ | 11/64+ | 9/64− | 7/64+ | 9/64+ | 1/16+ | 1/16− | 1/64− |
| 9 | 0.012 | 2.304 | 1.152 | 0.768 | 0.576 | 0.384 | 0.288 | 0.240 | 0.192 | 0.144 | 0.120 | 0.096 | 0.072 | 0.048 | 0.048 |
| | | 2 19/16+ | 1 5/32+ | 49/64+ | 37/64− | 25/64− | 9/32+ | 1/4− | 5/16+ | 9/64+ | 1/8− | 3/32+ | 5/64− | 1/64+ | 1/64+ |
| 10 | 0.012 | 2.304 | 1.152 | 0.768 | 0.576 | 0.384 | 0.288 | 0.240 | 0.192 | 0.144 | 0.120 | 0.096 | 0.072 | 0.060 | 0.048 |
| | | 2 19/64+ | 1 5/32+ | 49/64+ | 37/64− | 25/64− | 9/32+ | 1/4− | 5/16+ | 9/64+ | 1/8− | 3/32+ | 5/64− | 1/16− | 1/64+ |
| 12 | 0.013 | 2.496 | 1.248 | 0.832 | 0.624 | 0.416 | 0.312 | 0.260 | 0.208 | 0.136 | 0.130 | 0.104 | 0.078 | 0.065 | 0.052 |
| | | 2 1/2− | 1 1/4− | 53/64 | 5/8 | 27/64− | 5/16 | 17/64 | 13/64 | 5/32 | 1/8+ | 7/64− | 5/64 | 1/16+ | 1/64+ |

IN FITTING such parts as turbine and generator couplings, press and shrink fits on tapers are often used. The accompanying table offers a convenient source for this essential information. Even a taper as great as 3 in. to the foot may be used on turbine or generator work in order to prevent the coupling from sticking when it is pulled on tight with a fine-thread nut on the shaft.

In the table, the first vertical column gives the size of the hole in inches, the second gives the allowance for a press fit, or in other words, the oversize of the stock. The top horizontal line shows the series of tapers per foot; the remaining lines give the length to allow for tightening in both thousandths and fractions of an inch, in order to make it usable even by shops that do not have micrometers in their equipment.

*Example:* It is required to fit a 6-in. coupling on a turbine spindle with a 2½-in. taper per ft. of length. The standard diameter allowance for a 6-in. press fit is 0.009 in. Enter the table at 6-in. size of hole, follow horizontally to the vertical column under 2½-in. taper per foot. This gives 0.045 in. in decimals or 3/64 in. in fractions to the nearest sixty-fourth.

*Example II:* It is required to fit a 6-in. diameter crankpin having a 1/16-in. per ft. taper. The allowance for press would again be 0.009 in. Follow the horizontal column headed by 6-in. size of hole to the vertical column headed by 1/16 in. taper per ft. of length. The allowance here is 1.728 in. or 1 47/64 in. to the nearest sixty-fourth.

Contributed by G. T. King

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# Arc-Welding Crawler Tractor Parts

L. R. CANFIELD
*Westinghouse Electric & Mfg. Co.*

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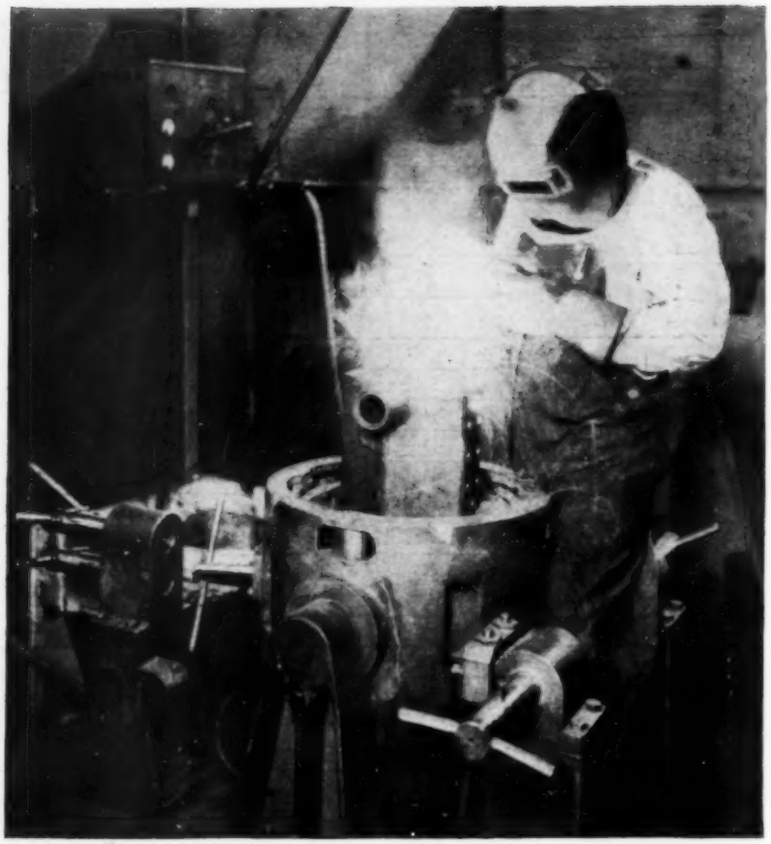
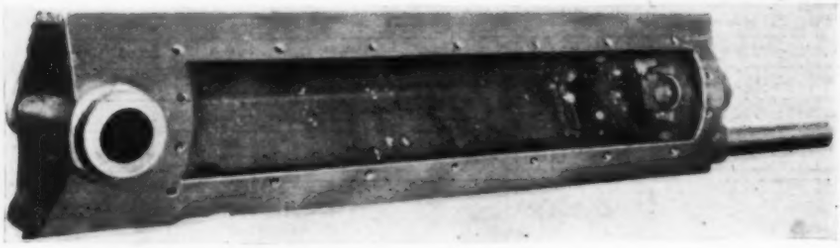
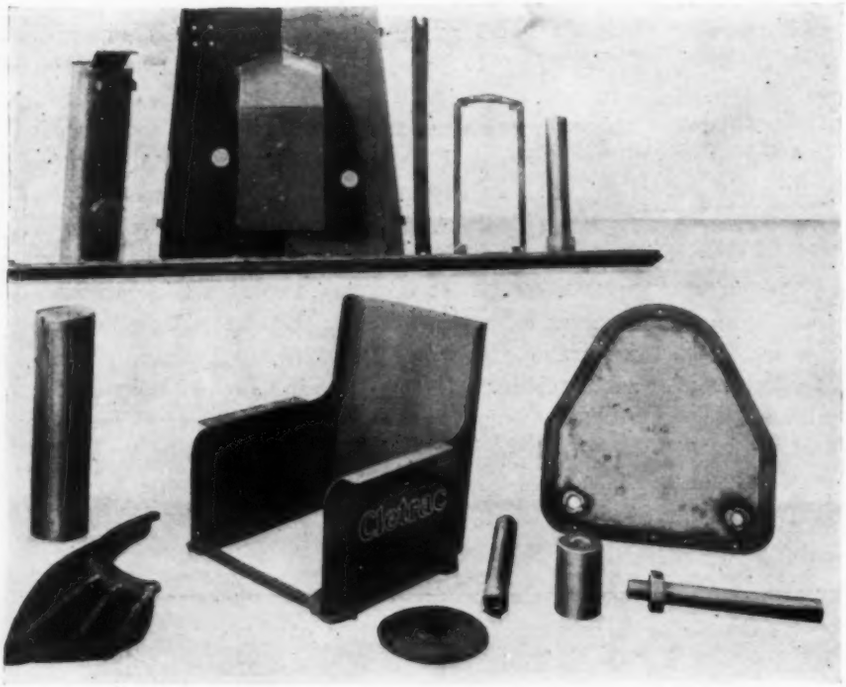
**Back in 1918, Cleveland Tractor Company began using electric arc-welding. Part after part has been redesigned for welding, until now the principal parts are thus fabricated**








THE TRACK FRAMES carry most of a tractor's weight, plus a big component of the working load. For the past year, Cletrac frames have been arc-welded at a cost saving of 25 per cent. Such a frame is a six-sided structure pressed out of ½-in. (for the 30-hp. machine) hot-rolled steel plate, with cast steel ends machined before welding. The ends are first tack-welded to the plate structure, machining accuracy being maintained by a jig. A conveyor delivers the frame to the finishing jig shown above, where welding is completed. The frame then appears as at left.

Other arc-welded parts for Cletrac tractors, also pictured at left, include (left to right and top to bottom): oil tank, tool box and hood, brake band, battery hold-down frame, exhaust pipe, oil manifold, oil tank, rock guard, seat, inspection cover, crank handle, track spring bumper, track spring adjusting stud, transmission cover. The long oil manifold is an interesting job. It is composed of two formed parts butt-welded all the way 'round, the manifold itself being attached to the frame by welding. The rock guard is welded from a cast steel shape braced by two steel plate sections.

# EDITORIALS

**February 11, 1932**

K. H. CONDIT • F. H. COLVIN
Editors

### To Filter Quickly

In current discussions of business conditions a considerable amount of attention is given to the liquid conditions of banks and the effect their efforts to become liquid have had on, for instance, the price of securities. Not so much emphasis has been placed on liquidity as applied to manufacturing concerns, yet the matter is far reaching, both in relation to changed thinking in management circles and in the ability of the manufacturing industry generally to respond quickly to an upturn in business.

In 1920 heavy inventories were carried and comparatively slim cash reserves were in evidence. The condition in this 1930-31 depression is just the reverse; small inventories are on hand with comparatively large cash reserves. This reversal in policy will permit business revival to filter quickly from one producing level to the next, unhampered by sluggish inventory reserves at each successive level.

### Five Millions for Educational Orders

Two identical bills, S.1660 and H.R.5601, authorizing the placing of educational munition orders have been introduced at Washington. The respective Committees on Military Affairs now have them.

As yet no word has reached us of the prospects for this legislation or of the intent to hold hearing. The bills, as they stand, meet the requirements set forth by those who have advocated such legislation for several years, in that the Secretary of War is given the necessary authority to place such orders with selected private concerns.

Coupled with the enabling clauses of the bills is a section authorizing appropriation of two millions annually for five years, half to be available for educational orders, half for the building of "special" ordnance at the Government-owned arsenals.

While the amount provided for the educational orders is not going to be of much help in providing work for civilian machinists and toolmakers, as urged in *American Machinist* more than a year ago, it is at least a recognition that it will be better to provide a new fund rather than to divert funds that would ordinarily be spent by the arsenals.

You are urged to watch these bills and to do what you can to expedite them when the proper time comes.

### Why Coals Go to New Castle

"Carrying coals to New Castle" is not the absurdity that it once implied. Instead it behooves us to study the conditions that make it possible to produce machinery or parts at great distances from their market, and to compete with local makers. This holds true whether the parts are produced in this country or elsewhere; it is not enough to credit the difference to cheap labor, for it may be due to better engineering or to more efficient production methods.

Two examples deserve serious consideration, both being successful manufacturers located on the Pacific Coast, at least two thousand miles from their best customers. One plant makes small automotive parts that go to the largest builders in the Detroit district. The other builds high duty pumping machinery used by municipalities and large private industries.

A study of these successful plants shows that particularly careful attention has been given to design and manufacture. High grade engineers are employed to design and to tool up for production; large sums have been spent in new machine equip-

ment; both plants secure high quality with low production costs. Then it is found that there is no magic arising out of climate or undue influence. Good design, good machine equipment, good management and persistent sales effort make a winning combination anywhere.

### Specifications to Forestall Trouble

Adequate specifications for machine tools or other mechanisms are always a problem. They can easily be too specific, or they can lack sufficient detail to secure the kind of machine really wanted. One recent purchaser specified only the size of bar the machine must handle, and the net result is a machine that stands idle a great deal of the time.

But the general run of specifications go into entirely too many details of machine construction and too few concerning what is required of the machine. Experience suggests that full details of expected performance should always be included, that details of construction be left to the builders, that the reliability of the various bidders be even more carefully considered than their prices. As one slogan used to say, "quality will be remembered long after the price is forgotten." And the right kind of specifications insure just exactly that.

## • CHIPS •

Best advice of the week comes from Baron Shidehara, former Japanese foreign minister, who advises his countrymen to "set aside face-saving and settle the trouble at Shanghai in concert with the other powers" . . . but the undeclared war goes on . . . and almost forces the Santiago earthquake off the front page . . . Great Britain's free trade policy comes to an official end . . . With foodstuffs and cotton exempted, all imports into the United Kingdom will be subject to an ad valorem of 10 per cent . . . British Dominions will not be affected, pending forthcoming Imperial Conference . . . At that, the British consul general predicts lowering of the anti-dumping tariff walls within the next few weeks . . . Bank of England repays final $75,000,000 borrowed from France without drawing on gold reserve . . . Understood that the old lady of Threadneedle Street has already taken similar action with Federal Reserve of New York. . . . France submits plan for arming League of Nations . . . move regarded as window dressing . . . Belgium orders $1,500,000 worth of airplanes from various English firms . . . U.S.S.R. advances food and clothing prices about 25 per cent . . . brings butter to $1.14 per lb. and shoes to almost $50 per pair . . . With that as backlog, she orders 130 new model Lincoln automobiles . . . Canada arranges rail wage cut of 10 per cent retroactive to December 1, 1931 . . . affects 30,000 workers.

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RELATIVITY

American investments in China total about $200,000,000, or 2 per cent of all American investments abroad; Great Britain and Japan have each invested five times as much. At that, Great Britain has but 5 per cent of her foreign eggs in the Chinese basket. But Japan finds herself with 50 per cent of all her foreign investments in the hands of her yellow brethren.

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President Hoover sounds the call to end hoarding . . . seems assured of able cooperation . . . about time with Bradstreet's wholesale price index at the lowest since July, 1, 1901 . . . $1,500,000,000 or more involved, each unit of which represents from $5 to $10 of dead and buried credit . . . American Legion set for its drive on unemployment . . . scheduled for Monday next . . . Fight for direct federal unemployment relief opens in the Senate . . . Vinson secures additional Congressional support for his treaty-fleet bill . . . No pacifist has yet blamed the Sino-Japanese affair on armament manufacturers . . . Speakers at National Retail Dry Goods warn against perils of cheap goods and their glorification . . . Dun's reports that retail trade in major cities is "more active than ordinarily at this period of the year" . . . and that renewed buying seems "assured" . . . Andrew Mellon becomes ambassador to Great Britain . . . Ogden Mills takes his portfolio as Secretary of the Treasury.

News from the automobile shows continues to percolate . . . Dealers at Milwaukee show booked more new car orders than at the 1930 and 1931 shows combined . . . Attendance at Los Angeles show gained 25 per cent over 1931 . . . at San Francisco, 35 per cent . . . General Motors enters air-conditioning field through Frigidaire . . . offers three types of air-conditioners . . . also cuts $7,862,459 melon with 30,222 employees in their "savings and investment class of 1926" . . . Locomobile bondholders buy company at auction . . . do not expect to manufacture cars again . . . Southern Pacific purchases New Orleans site for a new $1,000,000 produce terminal . . . will buy 20,000 tons of rails shortly . . . Warner Gear Company is putting Muncie plants in full operation . . . adding 600 men to present force of 1,500 . . . Rockford Northwestern Malleable Corporation and Gunite Corporation merge as Gunite Foundries Corporation . . . Santa Fe forecasts $12,000,000 capital expenditures for 1932 . . . Westinghouse Electric & Mfg. officials predict that Springfield, Mass., plant will operate this year at maximum capacity . . . Wilcox-Rich Corporation—division of Eaton Axle & Spring—acquires assets and business of Holley Permanent Machine, Inc., and gray iron casting business and equipment of Holley Carburetor Company . . . purchase made through a subsidiary, the Eaton-Erb Foundry Company . . . Annual winter meeting of American Institute of Mining and Metallurgical Engineers will be held February 15-18, in New York City . . . January steel ingot production 150,000 tons above December . . . 1,461,290 tons against 1,302,399 . . . F. W. Steere Company organizes to manufacture "windmill" planes under the De La Cierva patents.

# • THE • INDUSTRY • WEEK • BY • WEEK •

## NEW YORK

A $30,000 list, containing a shaper, radial drill, 2 lathes, small grinder and a large amount of woodworking equipment, was quoted on Tuesday for a State Hospital for the Insane in Brooklyn. School lists are expected soon, and it is hoped that these will be offered under a new plan suggested by dealers which will avoid millwrighting previously done by the supplier. The plan was submitted Feb. 4, and thus far has had favorable reception. If accepted, it will mean better prices for school tool purchases. One dealer sold four good-sized machines to scattered sources, one for export to South America. Several others sold single tools for the new Cornell Medical Center. Another dealer provided a new plant with drillpress, arbor press, and milling machine. Prospects are generally better; one dealer sold several tools on inquiries over a year old. None of these orders is regarded as an indication of a trend.

## CLEVELAND

An encouraging sign is the increased number of well-diversified inquiries received in the past two weeks. Automobile and refrigerator manufacturers are prominent in their requests. January sales as a whole showed very little improvement. Here and there an occasional ripple was felt. An automatic manufacturer showed a 25 per cent increase. One dealer showed an increase in the number of tools sold, but his dollar and cents margin was off.

## MILWAUKEE

Thus far this year the local machinery and machine tool business has not maintained the improvement noted during the closing period of 1931. Factors are divided in their opinion of the first quarter. One manufacturer reports an order of about $100,000 worth of milling machines from a large automobile manufacturer and plans full production schedules starting about the middle of February. Another manufacturer reports a scattering of small orders which lack the desired volume, but is encouraged and confident with the improving sentiment in the trade.

## SOUTHERN DISTRICT

Sales of machinery and machine tools are at a minimum. Orders consist chiefly of small tools, while spasmodic inquiry brings some small business in the used machinery line. With little new development in industry and a general curtailment of railroad and shipbuilding business, sluggishness necessarily continues.

General business conditions are favorable, and optimism is expressed. This optimism, moreover, appears to be more soundly founded than recent expressions of a like nature.

# Progress in Metal-Working and Machinery Markets

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**UNEVENTFUL weeks succeed each other as tool makers and dealers alike await tangible indications of a turn for the better . . . Here and there are builders and sellers who are busy, but rarely for long and not thus far on tools for expansion . . . Here and there are signs of improvement, but tool men have waited so long they are chary of any prediction . . . Strangely, all continue optimistic, if anything, far more optimistic than they were last year . . . There is a definite feeling that we are on the way out.**

**NEW YORK had several encouraging indications last week, including the issue of a $30,000 list for a hospital, sale of a number of single tools, some to Cornell Medical Center, some on year-old inquiries, three tools to a new plant . . . School lists are in prospect, based on a new no-millwrighting plan . . . Cleveland is cheered over inquiry increases, particularly from automobile and refrigerator manufacturers, though January sales showed little improvement . . . One automatic manufacturer there stepped up 25 per cent; one dealer showed more sales but smaller dollars-and-cents return . . . A Milwaukee manufacturer sold $100,000 worth of milling machines to an auto builder, plans full production starting Feb. 15, will offer six new types of machines soon . . . Other factors there hold about even . . . Southern District sales, on the contrary, are at a minimum, orders being principally for small tools.**

**DETROIT, awaiting some indication of Ford's plans, finds other automobile production not stepping up as expected, machine tool sales consequently lacking . . . New England has a sprinkling of orders and an occasional list, the latest including seven tools . . . Philadelphia feels low, with inquiries off and sales small . . . Chicago's January maintained the December level . . . Grinding equipment sales were better . . . Cincinnati sells an occasional tool.**

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## DETROIT

Almost all types of enterprises are apparently awaiting the forward movement of the automotive industry. Automobile manufacturing has not been speeded up as a great many observers believed it would be, and because of the continued idling, the sales of machinery and machine tools have dropped to unusual lows. Automobile executives are frankly awaiting the announcement of Ford plans. The new models are expected to be sufficiently radical and low-priced to command attention.

## NEW ENGLAND

Machine tool agents report a sprinkling of orders, otherwise the days are uneventful. An occasional inquiry promises a list. One lists an 18-in. lathe, power saw, press, upright drill, bench lathe, No. 2 miller and 16-in. shaper. Grinding machine companies are getting a fair list of single machine orders, mostly from the Middle West. The Navy Department continues to buy intermittingly, but totals are small.

## PHILADELPHIA

A few small orders for mechanical equipment were received during the last two weeks, but otherwise the market continued its same lethargy. Dealers complain that prices are off. Inquiries have been few and far between, with little indication that orders will follow. No guess is hazarded on how soon business may be resumed, but it is estimated that Spring will be well along before any reopening of industry can logically be expected.

## CHICAGO

Indications of a slight upward turn in the machine tool market are not entirely lacking. January's business was about on a par with that of December. In one or two lines a distinct improvement was reported for the month, notably in grinding machinery. A Mid-West concern whose output consists largely of a certain type of grinding machines had sales for January materially in excess of those for the several months preceding. An Eastern company specializing in grinding tools and abrasives has had an increase in inquiries recently, those of January exceeding one daily.

## CINCINNATI

Machine tool manufacturers note no change in the general situation. Selling agents made a few small sales and had a slight increase in inquiries. A local manufacturer of radio receivers added a few needed tools for the construction of domestic electric refrigerators. The principal buyers were general machinists and miscellaneous users, whose requirements in the main were single items for replacement purposes.

# MATERIAL TRENDS AND PRICES

Improvement in inquiry for structurals and expansion in requirements for steel sheets, other than automotive, are two important factors to be considered in a market lacking in notably bright spots. The automotive industry is expected to increase its requirements shortly, while the railroads probably will take more materials than of late, with the exception of rails. Nonferrous metals, whether new or scrap, showed little fluctuation in the last week. As exceptions, tin-dropped back after a rise and Chinese antimony held firmly to the new levels gained Feb. 4, by a jump of 1c. per lb. The rise in antimony, however, has not as yet affected prices of alloys.

*(All prices as of Feb. 5, 1932)*

## IRON AND STEEL

| Pig Iron — | Current | Mo. Ago | Yr. Ago |
|---|---|---|---|
| Birmingham, No. 2, Fdry., per gross ton | $10.00@$12.00 | $11.00 | $13.00 |
| Buffalo, No. 2, Fdry., per gross ton | 15.00@ 16.00 | 15.00 | 17.50 |
| Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton | 10.00 | 10.00 | 12.75 |
| Furnace Coke — Connellsville, per net ton | 2.25 | 2.25 | 2.40 |
| Foundry Coke — Connellsville, per net ton | 3.25 | 3.25 | 3.25 |
| Steel Shapes — Pittsburgh, base, per 100 lb. | 1.50 | 1.50 | 1.65 |

**Iron Machinery Castings** — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.

| | | | | | |
|---|---|---|---|---|---|
| Chicago | 4.62½ | Cleveland | 4.50 | New York | 4.75 |
| Cincinnati | 4.35 | Detroit | 4.00 | | |

**Steel Sheets** — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

| | Pitts. Mill | Chicago | Cleveland | New York |
|---|---|---|---|---|
| Hot-rolled, No. 10 | 1.85 | 3.20 | 3.00 | 3.00 |
| Hot-rolled, No. 24 | 2.40 | 3.55 | 3.25 | 3.50 |
| Galvanized, No. 24 | 2.90 | 4.10 | 3.75 | 4.00 |

**Seamless Steel Tubing** — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

| Thickness of Wall | | Outside Dia. in Inches | | | | | |
|---|---|---|---|---|---|---|---|
| Inches | B.w.g. | ½ | ⅝ | ¾ | ⅞ | 1 | 1¼ | 1½ |
| | | Price per Foot | | | | | | |
| .035 | 20 | $0.15 | $0.16 | $0.17 | $0.18 | $0.19 | $0.21 | $0.23 |

**Shapes, Plates, Bars, Etc.** — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Bands | 3.40 | 3.00 | 2.95 |
| Bars, soft steel | 3.10 | 2.75 | 2.75 |
| Cold fin., flat or square | 3.90 | 3.60 | 3.60 |
| Cold fin., round or hexagon | 3.40 | 3.10 | 3.10 |
| Cold rolled strips | 4.95 | 6.00 | 5.50 |
| Floor plates | 4.85 | 5.00 | 5.00 |
| Hoops | 3.75 | 3.65 | 3.50 |
| Rivets | 4.00 | 4.00 | 4.00 |
| Shapes | 3.10 | 2.95 | 3.00 |
| Spring steel | 4.00 | 4.00 | 4.00 |
| Tank plates | 3.10 | 2.95 | 3.00 |

**Stainless Steel** — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

| Chromium | | Chromium | |
|---|---|---|---|
| 15% and under | 19.00 | 18 to 23% | 23.00 |
| 15 to 18% | 20.50 | 23 to 30% | 28.00 |

**Bolts and Nuts** — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except tire and stove) nuts, and lag screws, mill lots ..... 73-10-10%

## NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:

| | |
|---|---|
| Aluminum ingots 99%, N. Y. | 23.30 |
| Copper, electrolytic, Conn | 7.50 |
| Copper wire, base, Chicago and Cleveland | 9.62½ |
| Copper wire, base, N. Y. | 9.50 |
| Lead, pigs, E. St. Louis | 3.55 |
| Tin, Straits, pigs, spot, N. Y. | 21.70 |
| Zinc, slabs, E. St. Louis | 2.90 |

Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:

| | |
|---|---|
| Brass rods, high | 11.12½ |
| Brass sheets, high | 13.37½ |
| Brass tubing, high | 16.62½ |
| Copper, drawn round | 14.12½ |
| Copper sheets | 16.62½ |
| Copper tubing | 16.12½ |

Prices following are in cents per lb., del. from N. Y. warehouse:

| | |
|---|---|
| Babbitt, anti-friction, general service | 28.50 |
| Babbitt, com'l, intermediate grade | 34.25 |
| Babbitt, genuine, highest grade | 43.00 |
| Solder, bar | 17.25 |

Prices following are in cents per lb., base, Huntington, W. Va.:

| | |
|---|---|
| Monel metal rods, hot rolled | 35.00 |
| Monel metal sheets, full finished | 42.00 |
| Monel metal tubing, seamless | 65.00 |
| Nickel rods, hot rolled | 45.00 |
| Nickel sheets, full finished | 52.00 |
| Nickel tubing, seamless | 75.00 |

**Scrap Non-Ferrous Metals** — Dealers' purchasing prices in cents per lb., f.o.b. cars:

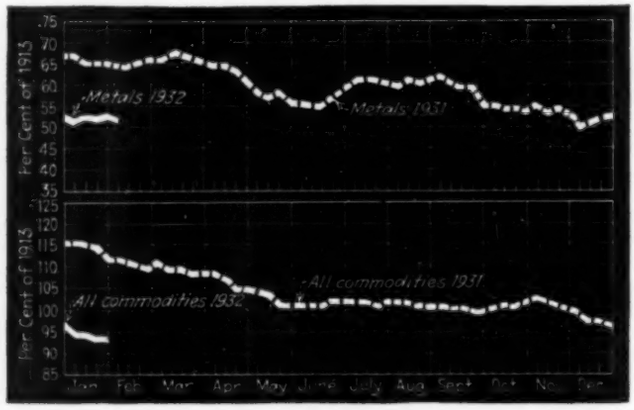
| | New York | Cleveland | Chicago |
|---|---|---|---|
| Heavy yellow brass | 2.75 | 2.75 | 2.75 |
| Light brass | 2.25 | 1.50 | 2.37½ |
| No. 1 rod-brass turnings | 3.00 | 3.00 | 2.50 |
| Heavy copper | 5.25 | 4.50 | 4.12½ |
| Light copper | 4.25 | 3.75 | 3.62½ |

## SHOP SUPPLIES

| (Prices at warehouse) | New York | Cleveland | Chicago |
|---|---|---|---|
| Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100 | $4.37 | $4.59 | $4.59 |
| Belting, leather, heavy | 30-10% | 40% | 40% |
| Belting, rubber, trans., Grade 1 | 60-10-10% | 60-10% | 60% |

Lumber — Per M ft., b.m., 12-16 ft. lengths, delivered, N. Y.:

| | | | |
|---|---|---|---|
| Crating — Southern pine: | | | |
| 1x4-in. | $27.00 | 1x6-in. | $26.00 |
| Skids — Spruce: | | | |
| 2x4-in. | $35.00 | 3x4-in. | $35.00 |
| 4x6-in. | $37.00 | 6x6-in. | $50.00 |


Per Cent of 1913
Metals 1932
Metals 1931
All commodities 1932
All commodities 1931
Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec

**Price Movements Week by Week**

*Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist*
*Seventy-Four Commodities Index—The Annalist*

# American Legion "Mobilizes"; Job Drive Begins on Feb. 15

**Committees in 7,000 cities to seek work for 1,000,000 in "War" on Depression —Action, not talk, object—"Army," now ready to act, claimed large as A.E.F.— Anti-Hoarding Move Praised**

COMMITTEES in more than 7,000 cities will go into action Feb. 15, representing the American Legion, American Federation of Labor and Association of National Advertisers, backed by welfare, church, civic and business organizations, in what is described as the greatest mass campaign since the World War, to obtain jobs for 1,000,000 unemployed.

This was announced Feb. 7 in a joint statement by HENRY L. STEVENS, JR., national commander of the American Legion; MATTHEW WOLL, vice-president of the American Federation of Labor, and LEE BRISTOL, president of the National Association of Advertisers, from the national headquarters of the campaign at the Hotel Biltmore, New York City.

The announcement followed a conference in Washington of Mr. Stevens, President Hoover and Carl Byoir, director of organizations of the United Action group, as the three organizations sponsoring the campaign call themselves.

The President authorized Mr. Stevens to say it was his hope that every forward-looking organization in the country would join in the war against depression.

Magazines and publications commanding a total circulation of 35,000,000 will cooperate in the drive. Nearly sixty prominent radio advertisers have agreed to contribute thirty seconds of their time daily to the campaign.

ANTI-HOARDING DRIVE PRAISED

"From coast to coast and from lakes to gulf our national campaign to put 1,000,000 workers back on payrolls will begin on Feb. 15," the joint statement said. "It is intensely gratifying that this tremendous campaign should be supported and complemented by a campaign directed from the White House to bring hoarded money into circulation. We shall have lines of idle men waiting for the release of every hoarded dollar."

President Hoover has shown that hoarding has accumulated to the extent of $1,250,000,000 or $1,500,000,000, that its results are to immobilize a large portion of the national gold supply and cause drastic deflation and credit contraction and seriously to restrict business expansion and maintenance. "A dollar hoarded not only ceases to perform its function as currency but destroys $5 to $10 potential credit," the announcement read. At the President's series of conferences Feb. 6 the support of individuals representing 20,000,000 people was pledged in the drive against hoarding of any sort.

## National Metal Congress In Buffalo, Week of Oct. 3

BUFFALO was selected for the fourteenth annual National Metal Congress and Exposition at a meeting of the Board of Directors of the American Society for Steel Treating in Cleveland, Feb. 5. The week of Oct. 3, 1932, was chosen as the date.

The exposition and afternoon technical sessions of the Congress will be held at the 174th Regimental Armory, a huge building which offers 105,000 sq.ft. of exhibit space, free from pillars and with every exposition facility. Ample and attractive meeting rooms for all Societies in the Congress are available within the Armory building.

This will be the first year that the National Metal Congress and Exposition has been held in Buffalo. The week of Oct. 3, two weeks later than the usual date of the Congress and Exposition, was selected at the request of exhibitors and members of the various Societies who felt that this would be more convenient to the majority of those interested.

## Variety of Machines At British Fair

A large number of leading British firms are to be represented at the 1932 British Industries Fair, Feb. 22 to Mar. 4, at Birmingham, and much new equipment will be shown under working conditions. The collection will include engines of a variety of sizes and designs for industrial purposes, welding equipment, small machine tools, die-casting machinery, and hydraulic presses. Also shown will be hydraulic pumps, annealing machines, springs and spring balances, trenching machines, bending presses, weighing equipment, conveyors, chains and couplings, bailing and packing presses, apparatus and accessories for foundries and furnaces, lubricating oils and storage equipment for oils, wire-forming machines, industrial oil burners, testing jigs, haulage gears, and driving belts and ropes.

## Report Large Sales At Motor Boat Show

A canvass at the close of the National Motor Boat Show at the Grand Central Palace, New York, showed that public sales of motor boats, sailboats and accessories had exceeded all expectation, according to the 200 exhibitors who displayed products. The annual meeting was held Jan. 29 at which officers were re-elected.

## Heating Exposition Held in Cleveland

The Second International Heating & Ventilating Exposition, held in the Cleveland Public Auditorium Annex the week of Jan. 25-29, broke all records for number and variety of displays. It was held simultaneously with the annual meetings of the American Society of Heating & Ventilating Engineers and the American Society of Refrigerating Engineers. Comprehensive displays of heating, ventilating and air conditioning were included and separate sections were devoted to gas burning appliances, oil burners and accessories, unit heaters and non-ferrous radiating surfaces, refrigerating and air-conditioning apparatus and domestic stokers. Something over 250 companies exhibited at the Show.

## "Gases in Metals" On A.I.M.E. program

"Gases in Metals" will be the subject of an 8-paper symposium added to the program for the 141st general meeting of the American Institute of Mining & Metallurgical Engineers, to be held in the Engineering Societies Building, New York City, Feb. 15-18. Also important during the meeting will be the unveiling of a three-quarter length portrait of President Hoover, painted for the four founder societies. The William Lawrence Saunders gold medal is to be pre-

sented to F. W. BRADLEY and the James Douglas medal to C. H. MATHEWSON at the annual dinner in the Commodore Hotel, Feb. 17.

The program of the Iron & Steel division includes a session on Iron & Steel Alloys on Feb. 17, a Blast Furnace & Raw Materials Conference that afternoon, a session on Corrosion-Resistant Metals the next morning, and a general session that afternoon. E. C. BAIN will deliver the Howe Memorial lecture Feb. 18, "On the Rates of Metallurgical Reactions in Solid Steel." Papers at the Iron & Steel division meeting include:

"Vanadium and High-Speed Steel," by A. B. KINZEL and C. O. BURGESS

"Iron Aluminum Alloys—Resistance to Oxidization at High Temperatures," by N. A. ZIEGLER

"Electro-Chemical Potentials of Nitrified Steel," by SHUNICHI SATOH

"Effect of Heat-Treatment on the Corrosion-Resistance of Stainless Iron," by C. G. MERRITT

"Prevention of Intergranular Corrosion in Chromite Nickel Corrosion-Resistant Steels," by P. PAYSON

"A Quantitative Method for the Estimation of Inter-Crystalline Corrosion in Austenitic Stainless Steels," by J. J. B. RUTHERBERG and ROBERT ABORN

"Pressure Welding of Low-Carbon Steels with Theoretical Consideration for the Mechanism of Such Welding," by C. R. AUSTIN and W. F. JEFFRIES

The program of the Institute of Metals division includes:

"Some Aspects of Alloy Building," by PAUL D. MERICA

"Effect of Temperature Upon the Charpy Impact Strength of Die-Casting Steels," by B. E. SANDELL

"An X-ray Study of the Nature of Solid Solutions," by R. T. PHELPS and W. P. DAVEY

"Structure of Cold-Drawn Tubing," by JOHN T. NORTON and R. E. HILLER.

## Welding Stressed In U. S. S. R. Plans

During the Welding Engineer's congress at Moscow, president Futorian informed the assembly that during the present year 4,500 electric arc-welding units would be produced in home works, as compared with 1,500 manufactured last year. For the near future a total of 60,000 welders and 2,500 welding engineers are to be trained for autogenous and arc welding. For this purpose eight independent welders' schools have been established, and all technical high schools are obliged to treat welding as a facultative course.

## Gray Iron Business Shows Increase

Increased business during December was quite surprising in the gray iron industry, for December is usually the low point of the year. But November holds 1931's low records, for in the closing month of the year, the gray iron industry swung slightly towards better business. Production increased from the November level of 37.1 per cent of normal to 37.6, while new business increased more than four per cent from 26.5 to 30.7. Unfilled orders declined slightly from 23.1 to 22.6. Increased activity was general with the exception of Ohio, Pennsylvania, Indiana and Michigan which fell off nearly five per cent. Three foundrymen view the future as good, 27 as fair, 47 as poor and 35 as bad, while one month ago only one foundry considered the outlook good while 40 considered it bad.

## G. E. Welding Design Course Successful

At the end of 1931, three months after the start, 61 students had completed the new General Electric course in the design of welded steel structures. Of this total, 27 were representatives and engineers of customers and the remainder were General Electric apprentices. Average time consumed in completing the course was four weeks. One student, however, stayed ten weeks for a supplementary course. Representatives and engineers came from all over the United States and from Canada and Russia.

## Metals Subject of Metropolitan Meeting

A joint meeting of the New York Metropolitan District Members, A.S.T.M. and the Iron & Steel Division, Institute of Metals Division and New York Section of the A.I.M.E., with cooperation of the New York Section, A.W.S., will be held Feb. 18 at the Engineering Societies Bldg., on the general subject of "Metals." F. O. CLEMENTS, technical director, Research Laboratories, General Motors Corp., and President of the A.S.T.M., will speak on "Limitations of our Fundamental Knowledge of the Properties of Metals." H. F. MOORE, professor of Engineering Materials, University of Illinois, will speak on "Test Results and Service Values of Metals" and JOHN J. CROWE, Air Reduction Laboratories, A. B. KINZEL and W. B. MILLER, Union Carbide & Carbon Research Laboratories, will join in a demonstration of methods of testing welds. These demonstrations of actual tests with explanatory discussion will cover: visual inspection, hammer and anvil nick-break test; bending test; tension test; hardness test; specific gravity test; stethoscopic test; invisible ray test; compression and drift test; hydrostatic internal pressure test. All engineers and others interested are invited to attend.

## Open Oil Burner Show to Entire Industry

A decision to enlarge the ninth annual Oil Burner Show, to be held in Boston, April 11-16, was made at the quarterly meeting of the directors. Heretofore, the show has been open only to members of the American Oil Burner Association. Under the new plan the membership requirement for accessory or associate exhibition is waived. The privilege of exhibiting oil burners will, however, be confined to members as heretofore. Headquarters for members of the association who will hold their annual convention during the week of the show have been established in the Hotel Statler and attendance of more than 10,000 persons is expected.

## THE BUSINESS WEEK

*February* 10, 1932

**On balance the level of business activity shows signs of slight weakening as the second month of the year starts. . . . In only a few lines —steel, shoes, textiles, automobiles —have there been any indications of the usual spring stimulus so far, and these have been mild. . . . Steel production of late has slackened slightly; carloadings and electric power production still show no improvement; commodity price averages have slowly sagged since the outset of the year. . . . The sharp decline in building contracts, particularly in public works projects, during January is depressing. . . . It is difficult to see how drastic reductions in purchasing power of construction and railroad workers can be expected to increase activity in these two basic industries; and the indifferent response of securities markets shows that they also have their doubts on this score. . . . . Although the amicable outcome of railroad labor negotiations should supply a more solid basis for the bond market, the day when wage cuts were considered a bull-point for stocks has probably passed . . . All eyes are now on the Reconstruction Corporation as it commences its attack on the cruical credit problem, and as the President appeals to the country to cooperate in checking deflation by halting hoarding. . . . The retarded rate of bank credit contraction and bank suspensions in recent weeks is an encouraging indication of favorable effect of the Administration's efforts on confidence. . . . Business revival and stabilization in security and commodity markets now depend altogether upon the success with which this strategy stems and turns the tide of credit liquidation during the next few months.**

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# Great Britain's Machine Tool Exports Increase, Other Trading Declines

FROM OUR LONDON OFFICE

THE balance sheet of Great Britain's 1931 overseas trading shows the anticipated shortage of export values in relation to import values. Despite abnormal import duties, imports during the last month or two were more than up to the monthly average for the year, while exports remained at somewhere about the average, or a little less. Thus total imports were valued at £862,174,709, exports of home produce at £389,163,817, with re-exports at £64,035,347, making total exports of £453,199,164. This gives an adverse visible balance of about 409 million pounds, from which about 33 millions must be deducted for the net movement of bullion and specie. To offset this are "invisible exports" which need not be detailed and of which no exact estimate is as yet available. It is anticipated that the gap will not be bridged and that when the final balance sheet is drawn up a deficit will be found, the lowest estimate of which at present is about 50 million pounds, against a credit balance of about 40 millions for 1930.

Suspension of the gold standard has not had the effect expected, though one or two industries have benefited, notably textiles. It is true that iron and steel production was for a time increased. Even so the total output of pig iron in 1931 was but 3,758,100 tons, as compared with 6,192,400 in 1930 and 7,589,300 in 1929, while the production of steel ingots and castings last year was 5,175,600 tons, as against 7,325,700 in 1930 and 9,636,200 in 1929. The light castings trade improved to some extent, and a few additional blast furnaces were blown in, but caution has been exercised. Any real improvement will depend more on statesmanship than on individual initiative even though the latter is certainly necessary.

Tables I to III here given show the movements of machinery into and out of Great Britain as reported by the Board of Trade. The figures may well be left to speak for themselves.

One or two other figures may be given regarding engineering production not included in the machinery class. As to exports, airplanes, etc., amounted in value to £1,861,467; locomotives of various kinds and their parts to £2,049,831; carriages to £1,168,578, and wagons and trucks to £945,027. Including private motor cars and cabs at £2,644,409, commercial vehicles at £751,692, and tractors at £54,637, the total for motor cars, parts and accessories, except rubber tires and tubes, is given as £6,412,325. The total for motor-cycles and parts is £1,660,355 and for other than mechanically-propelled cycles £1,526,659. The value of steam vessels exported was £5,798,715, and of motor vessels £2,735,688, the total for ships and boats (not registered as British) being £9,283,275. In imports the total value of motor cars, etc., and parts is entered at £3,184,613, of motor cycles and tri-cars and parts at £9,552, and of pedal cycles, parts and accessories, at £431,420.

The total export of ships, etc., at £9,283,255, is considerably less than half that for 1930, £20,142,416. Indeed, during 1931 the tonnage launched was but 466,000, while at the end of the year the total on the stocks was only about

TABLE I — IMPORTS OF MACHINERY

| | Quantities | | | Value | | |
|---|---|---|---|---|---|---|
| | 1929 | 1930 | 1931 | 1929 | 1930 | 1931 |
| | Tons | Tons | Tons | £ | £ | £ |
| Agricultural | 8,304 | 9,494 | 11,359 | 581,349 | 620,418 | 760,223 |
| Boilers and boiler house plant | 2,454 | 1,798 | 1,308 | 242,788 | 192,931 | 146,150 |
| Dairy machinery | 948 | 1,007 | 1,111 | 184,436 | 185,672 | 297,778 |
| Electrical machinery | 6,974 | 5,681 | 4,918 | 1,901,218 | 1,818,233 | 1,636,306 |
| Machine tools (metal-working) | 11,077 | 10,948 | 10,782 | 1,951,425 | 1,713,458 | 1,607,838 |
| Mining machinery: | | | | | | |
| Coal cutters | 244 | 111 | 115 | 80,621 | 41,272 | 44,242 |
| Prime movers (not electrical) | 7,578 | 13,258 | 2,970 | 898,487 | 1,378,405 | 413,786 |
| Paper-making machines | 2,419 | 1,168 | 1,345 | 283,310 | 187,734 | 211,464 |
| Printing, book-binding, etc., machines | 6,346 | 6,776 | 4,063 | 1,459,484 | 1,569,771 | 1,023,231 |
| Pumps | 4,150 | 3,229 | 2,005 | 576,716 | 510,343 | 298,500 |
| Sewing machines (complete) | 732 | 558 | 699 | 185,528 | 167,324 | 206,749 |
| Sewing machines (parts) | 1,103 | 960 | 792 | 520,099 | 436,836 | 397,680 |
| Textile machinery | 8,933 | 5,465 | 5,756 | 1,684,518 | 1,102,225 | 1,115,119 |
| Typewriters (complete) | 1,039 | 875 | 1,074 | 741,855 | 596,561 | 628,793 |
| Typewriters (parts) | 121 | 95 | 97 | 115,874 | 91,741 | 91,494 |
| Machines and machinery, all other sorts | 51,152 | 46,689 | 44,751 | 7,745,452 | 7,307,554 | 6,556,104 |
| | 113,574 | 108,112 | 93,145 | 19,153,160 | 17,920,478 | 15,345,457 |

TABLE II — EXPORTS OF MACHINERY

| | Quantities | | | Value | | |
|---|---|---|---|---|---|---|
| | 1929 | 1930 | 1931 | 1929 | 1930 | 1931 |
| | Tons | Tons | Tons | £ | £ | £ |
| Agricultural | 23,991 | 21,600 | 12,431 | 1,871,399 | 1,644,628 | 966,542 |
| Boilers and boiler house plant | 54,669 | 62,762 | 50,914 | 2,814,926 | 3,325,078 | 2,548,917 |
| Cranes, hoists, etc. | 34,857 | 34,669 | 21,510 | 2,311,203 | 2,208,722 | 1,451,127 |
| Electrical machinery | 38,975 | 41,212 | 27,255 | 6,347,541 | 6,345,621 | 4,358,689 |
| Grain milling machinery | 3,837 | 3,078 | 2,437 | 365,514 | 286,386 | 228,174 |
| Machine tools (metal-working) | 16,234 | 13,915 | 14,621 | 2,153,014 | 1,856,226 | 2,062,089 |
| Sugar-making and refining machinery, (other than centrifugal) | 10,074 | 5,694 | 4,048 | 622,636 | 342,215 | 240,379 |
| Prime movers (not electrical) | 52,435 | 37,498 | 23,810 | 5,411,977 | 4,130,720 | 2,892,914 |
| Paper-making machines | 4,221 | 1,970 | 1,484 | 423,974 | 237,854 | 193,709 |
| Printing, bookbinding, etc., machines | 5,453 | 4,862 | 3,042 | 1,208,764 | 1,120,848 | 728,031 |
| Pumps | 8,894 | 8,147 | 6,216 | 1,285,787 | 1,214,896 | 862,135 |
| Sewing machines (complete) | 838 | 857 | 667 | 190,839 | 172,751 | 123,085 |
| Sewing machines (parts) | 33,030 | 20,759 | 14,100 | 3,228,838 | 2,026,176 | 1,362,902 |
| Textile machinery | 126,553 | 91,212 | 55,567 | 11,643,902 | 8,628,162 | 5,280,713 |
| Typewriters (complete) | 41 | 50 | 25 | 87,155 | 89,139 | 47,878 |
| Typewriters (parts) | 84 | 39 | 57 | 78,063 | 60,402 | 56,871 |
| Woodworking machinery not elsewhere specified | 1,838 | 1,436 | 813 | 247,838 | 196,203 | 121,332 |
| Machines and machinery, all other sorts | 146,239 | 132,126 | 89,361 | 14,057,451 | 12,987,979 | 9,313,720 |
| Total of machinery | 562,263 | 481,886 | 328,358 | 54,350,821 | 46,974,006 | 32,839,207 |

TABLE III — RE-EXPORTS OF MACHINERY

| | Quantities | | | Value | | |
|---|---|---|---|---|---|---|
| | 1929 | 1930 | 1931 | 1929 | 1930 | 1931 |
| | Tons | Tons | Tons | £ | £ | £ |
| Agricultural | 673 | 755 | 813 | 57,783 | 56,230 | 57,387 |
| Dairy machinery | 227 | 131 | 134 | 36,644 | 21,129 | 23,434 |
| Electrical machinery | 312 | 351 | 368 | 125,409 | 139,537 | 122,465 |
| Machine tools (metal working) | 374 | 262 | 294 | 72,619 | 52,502 | 55,988 |
| Prime movers (not electrical) | 104 | 178 | 506 | 29,328 | 39,726 | 55,944 |
| Printing, book-binding, etc., machines | 225 | 208 | 149 | 85,663 | 67,214 | 64,337 |
| Pumps | 177 | 220 | 148 | 35,708 | 38,717 | 27,175 |
| Sewing machines (complete) | 32 | 31 | 22 | 28,104 | 23,483 | 16,086 |
| Sewing machines (parts) | 594 | 464 | 319 | 247,865 | 208,521 | 138,604 |
| Textile machinery | 281 | 259 | 168 | 168,723 | 113,528 | 95,899 |
| Typewriters (complete) | 63 | 60 | 55 | 64,758 | 52,507 | 45,323 |
| Typewriters (parts) | 7 | 7 | 2 | 6,246 | 5,843 | 3,953 |
| Machines and machinery, all other sorts | 2,631 | 3,404 | 2,129 | 671,518 | 737,608 | 509,104 |
| Total of machinery | 5,700 | 6,330 | 5,107 | 1,630,368 | 1,556,545 | 1,215,699 |

TABLE IV — DISTRIBUTION OF MACHINE TOOL EXPORTS

| | Tons | £ |
|---|---|---|
| To countries of Europe | 10,299 | 1,523,181 |
| Union of South Africa | 527 | 71,594 |
| British India | 1,588 | 200,326 |
| Australia | 116 | 14,719 |
| Other countries | 2,091 | 252,269 |
| | 14,621 | 2,062,089 |

400,000 tons, and even of this work some 150,000 tons was suspended. Shipbuilding all over the world declined, though proportionately more in Great Britain than elsewhere. Great Britain is still first, but not to the former extent, for it is understood that at the beginning of this year some 207,000 tons was under construction in the United States, 178,000 tons in Italy, 164,000 tons in France, 104,000 tons in Germany, and 95,000 tons in Sweden.

The total value of production during a given period, in the instance of Great Britain is not available, except soon after a census of production. The figures for export apply to only one part; there is home consumption to be considered, but here little of a statistical character is available. Data however can be obtained on the employment of insured workpeople, and here, according to the Ministry of Labor, an improvement was noted in the last quarter of 1931, so that by December the estimated number of insured workpeople in employment rose to 9,593,000, although the average taken over the whole year was 9,409,000. Wages declined to some extent, the average decrease for all industries combined, including agricultural, being more than 2 per cent of the wage rates prevailing at the beginning of the year.

As usual, the European edition of *American Machinist* has obtained a special return showing overseas trading last year in machine tools, according to classes. The imports amounted to 10,782 tons, valued at £1,607,838 or say £149 per ton, exports amounted to 14,621 tons, valued at £2,062,089 or say £141 per ton, and re-exports totaled 294 tons, worth £55,988 or say £190 per ton. In exports, the largest single class was formed by lathes, namely, 4,192 tons valued at £685,958 or £164 per ton. Drilling machines followed, namely, 2,900 tons at £424,271 or £146 per ton, the next highest entry as regards values being 1,335 tons of grinding machinery at £251,999 or £189 per ton. In imports, presses, punching and shearing machines predominated, 5,301 tons being brought in, valued at £441,087 or say £83 per ton. The ton value shown for these machines is, in fact, exceptionally low, for in exports the total quantity, 1,305 tons, was valued at £104,080 or £79 per ton, and even the small quantity of re-exports of this class, namely, 27 tons, was valued at no more than £1,417 or £52 per ton.

Most of the imports were from America and Germany. By far the largest proportion of machine tools exported went to Russia. This can be gathered from Table IV, where the countries of Europe are shown to be responsible for about three-quarters of the total exports, and by countries of Europe is meant Russia, followed at a long distance by France. Particularly as regards India and Australia, British dominion demand has fallen away very definitely. While South Africa has been a declining market, it still took just about the same value of machine tools as in 1926. Exports to British India were of but half the value, and to Australia only about one-fifteenth the value of similar exports in 1926. The predominance of Russia as a customer for British machine tools is, in fact, a source of some little perturbation. Recently, at any rate, more orders from that area could have been obtained, but the terms of credit were far too extended to enable insurance to be effected with the government department concerned. The other principal market for machine tools, namely the automobile industry, is for the present at least not very active, and few such firms can be regarded as really busy.

# German Machinery Exports Exceed Home Consumption

BY OUR BERLIN CORRESPONDENT

GERMAN exports have developed not unfavorably during the course of the present world crisis; its volume dropped by only 4.5 per cent in 1930, compared to 1929, and in the first ten months of 1931 the decrease was about 10 per cent in comparison to the same period of 1930. Thus the decline is much smaller than in other industrial countries. During the last few months, however, exports have increased, and in the months of July-October, 1931, the volume of German exports was hardly lower than during the same period of 1930. This favorable development must be attributed to a large extent to deliveries to the USSR. Thus during the third quarter of 1931 exports to that country amounted to:

9.9% of total German exports
11.2% of finished goods exported
23.2% of ironware exported
33.7% of machines exported

In October alone 32 per cent of German ironware, and 41 per cent of German machine exports, went to the USSR. Thus, at present, the German machine industry is producing far more machines for the Soviet Union than for the home market. During the year 1931 the USSR became the most important foreign customer of German heavy industry. The following table demonstrates the fact that the Soviet Union takes the first place among the customers for ironware, machines, electrical machinery, electrotechnical products, motor vehicles and products of the precision instrument works:

GERMAN EXPORTS, IN MILLION DOLLARS

| | 9 Months 1931 | 1930 | 1929 |
|---|---|---|---|
| Ironware: | | | |
| U S S R | 44 | 25 | 17 |
| Holland | 27 | 51 | 61 |
| France | 23 | 38 | 23 |
| Great Britain | 18 | 31 | 35 |
| Switzerland | 10 | 18 | 18 |
| Machines: | | | |
| U S S R | 38 | 36 | 21 |
| France | 22 | 41 | 30 |
| Holland | 10 | 16 | 16 |
| Great Britain | 9 | 15 | 16 |
| Italy | 7 | 12 | 14 |
| Electric Machines and Equipment: | | | |
| U S S R | 9 | 8 | 6 |
| Holland | 9 | 15 | 15 |
| France | 7 | 9 | 9 |
| Great Britain | 7 | 10 | 9 |
| Sweden | 5 | 8 | 7 |
| Motor Vehicles: | | | |
| U S S R | 2.1 | 0.7 | 0.8 |
| Switzerland | 1.4 | 1.3 | 1.– |
| Belgium | 1.– | 0.5 | 0.4 |
| Precision Instruments: | | | |
| U S S R | 1.3 | 1.4 | 1.9 |
| France | 1.3 | 2.2 | 2.– |
| Italy | 1.– | 1.7 | 1.6 |
| Holland | 0.9 | 1.6 | 1.7 |
| Czechoslovakia | 0.9 | 1.6 | 1.9 |

Exports of the above-mentioned goods to the USSR, excepting precision instruments, were larger during the first nine months of 1931 than in the same period of 1930. Total exports to the Soviet Union during 1930 amounted to $102,600,000, for the first nine months of 1931 to $120,700,000. German exports to the USSR for the last three years show a rapid increase, while with regard to the other countries, an enormous decline must be recorded for ironware as well as machines and products of the electrotechnical industry. The decisive importance of sales to the USSR for the various branches of manufacture may be seen from the following table:

USSR's SHARE OF EXPORTS OF CERTAIN MACHINES DURING JULY-OCTOBER, 1931

| | Per Cent |
|---|---|
| Stationary engines, over 6 tons | 45.2 |
| Steam and gas turbines | 92.9 |
| Diesel engines for ships | 43 |
| Combined steam-gas turbines | 47 |
| Dredgers, pile-drivers | 64.1 |
| **Metal-working machines** | **51.1** |
| Steam and hydraulic forges, etc. | 61.5 |
| Pumps | 43.1 |
| Sorting machines for coal, ore, etc. | 71.9 |
| Blast machines, exhaustors, etc. | 66.2 |
| Ball and roller bearings | 51 |
| Railroad rails | 38 |

This comparatively extensive export has, for German industry, until lately been a certain substitute for decreased home requirements. German exports, however, are about to suffer bad times, as a number of European countries intend to throttle their imports by means of high duties. Thus an increased

number of voices from industry are demanding higher export credits and securities from the Government, a condition required through the periods of payment of the Russians, without which the German industry would be in a hopeless condition.

With a total value of $76,000,000, German foreign trade in machines during the third quarter of 1931 was 7 per cent and 10 per cent, respectively, higher than the figures for the first and second quarters of that year, but remained 15 per cent behind the amount for the corresponding period of 1930.

Machine imports, after the seasonal rise in the second quarter, sank again during the third quarter to the figure for the first quarter, viz., about 6,400 tons, valued at $5,200,000. While during the months of July and August, machines were still imported to the value of about $1,800,000 per month, the import value dropped, in September, to about $1,500,000. This decrease was mainly due to lower imports of foreign textile machines, cash registers and large special machines.

Machine exports in the third quarter of 1931, amounted to about $70,720,000, the volume being about 145,000 tons. This was approximately $7,600,000 = 10 per cent and 9,000 tons = about 7 per cent higher than exports for the second quarter of 1931, but remains behind those of the third quarter of 1930 by 15 per cent. The highest monthly export figure of the year 1931 was attained in July, about $26,650,000. August and September saw German machine exports amount to about $21,900,000 each. The increase compared to the figures for the second quarter, 1931, was due to locomotives, about $1,190,000, power equipment, about $1,430,000, and machine tools, about $7,850,000. By far the largest part of this increase (over 90 per cent) of machine tool exports is to be attributed to larger exports to Russia. A drop in exports was to be noted in agricultural machinery, by about $1,420,000, in mechanical conveyors, by about $1,200,000, and in machines for the paper making and printing industry, by about $600,000. The export figures for the other classes of machinery do not show any noteworthy changes compared to those of the second quarter of 1931.

In one of the recent numbers of this paper, I mentioned the increasing importance of Switzerland as a competitor in the world market. The USSR Trade representation at Berlin has just issued a report according to which last year alone exports of Swiss goods have in some cases risen to over three times the former figures. The following table gives more detailed information:

| | 1929 | 1930 |
|---|---|---|
| | (In thousand dollars) | |
| Machine tools | 93 | 266 |
| Other machines | 162 | 231 |
| Tin ware | ... | 21 |
| Forged goods | ... | 80 |
| Motor vehicles | 127 | 779 |
| Airplanes | 12 | 452 |
| Various instr. and app. | 152 | 493 |

## Worthington Pump Personnel Changes

Worthington Pump & Machinery Corp., New York City, has announced the following personnel changes, effective Feb. 1:

C. E. WILSON, for past nine years general sales manager, appointed vice-president in charge of industrial relations. Mr. Wilson joined Worthington in 1899 as a Chicago office salesman and since that time has been sales manager, assistant general sales manager and assistant general sales manager in charge of foreign business.

CLARENCE E. SEARLE, for past seventeen years general representative in charge of sales for Allis-Chalmers Mfg. Co., has been appointed vice-president in charge of sales.

WILLIAM H. BAUMES, treasurer for the past fourteen years, has been retired at age of 61. He was comptroller of Worthington for three years previous to his appointment as treasurer.

CHARLES N. BARNEY, for past fourteen years secretary and general counsel, has been appointed secretary, treasurer and general counsel.

A. L. PRENTICE, formerly assistant comptroller, appointed assistant treasurer. WALTER LEHMAN remains, as formerly, assistant treasurer in charge of credits.

FRANK D. TALMAGE, formerly member of counselor's staff, appointed assistant secretary.

## Federal Specifications

A new Federal Specification for structural steel for cars has been issued as a proposed revision of FS-373a. Proposed revisions of FS-351a on Structural Steel for Bridges, 350a on Concrete Reinforcement Bars, 352a on Structural Steel for Buildings, 391 on Refined Wrought Iron Bars, and 273 for Spiegeleisen have been issued for approval.

### Germany's foreign trade in machines for the third quarter, 1931

| Article | Imports (In thousand dollars) July | Aug. | Sept. | Exports (In thousand dollars) Aug. | Sept. | Oct. |
|---|---|---|---|---|---|---|
| Machine tools | 186 | 112 | 150 | 7,595 | 5,930 | 5,287 |
| Textile machines and accessories | 305 | 402 | 273 | 2,538 | 2,134 | 2,235 |
| Agricultural machines and implements | 163 | 152 | 140 | 1,227 | 668 | 550 |
| Locomotives and tenders | ... | ... | ... | 671 | 768 | 664 |
| Power equipment | 241 | 160 | 170 | 3,804 | 2,958 | 3,058 |
| Pumps, compressors | 123 | 70 | 80 | 1,478 | 1,356 | 1,404 |
| Cranes, lifts, balances, etc | 34 | 30 | 16 | 2,119 | 1,336 | 1,440 |
| Machines for paper and printing industries | 113 | 55 | 36 | 1,485 | 1,358 | 1,469 |
| Machines for foodstuffs and chemical industries | 15 | 5 | 6 | 426 | 373 | 495 |
| Machines for the dressing of coal, ores, stones, etc | 9 | 2 | 4 | 436 | 638 | 437 |
| Other machines, parts and accessories | 635 | 870 | 650 | 4,960 | 3,971 | 4,892 |

## $7,862,459 to Staff of General Motors

A distribution of $7,862,459 in cash and securities is being made by General Motors Corp. to 30,222 of its employees who invested in its savings and investment fund of 1926, which matured on last Dec. 31. The number of employees sharing in the distribution is 50 per cent greater than the 20,009 of last year. The sum is represented by $4,923,341 in cash and 129,905 shares of General Motors common stock, valued at the year-end market price, at $2,939,108. According to ALFRED P. SLOAN, JR., president, 106,000 G.M. employees are participating in various savings funds.

# BUSINESS ITEMS

### Purchases

Wilcox-Rich Corp., division of Eaton Axle & Spring Co., has acquired the assets and business of Holley Permanent Mold Machine, Inc., Detroit, and the gray iron casting business and equipment of the foundry division, Holley Carburetor Co., according to an announcement by J. C. Eaton, president of Wilcox-Rich. The purchase was made through a subsidiary, Eaton-Erb Foundry Co. All foundry and machine equipment purchased will be transferred to Vassar, but sales offices will be maintained at the Wilcox-Rich general offices, 9771 French Road, Detroit. The manufacture and sale of permanent mold machines will be continued by the purchasers. FREDERICK ERB continues as president of the Eaton-Erb Foundry Co., with J. L. DOSTAL, formerly general manager in charge of the sale of foundry service and permanent mold machine equipment of Holley Permanent Mold Machine, Inc., as vice-president. Other officers include F. A. BUCHDA, treasurer, and J. H. BERNARD, secretary. The board of directors is made up of J. C. EATON, C. W. MILLER, FREDERICK ERB, J. L. DOSTAL and R. H. DAISLEY.

Consolidation of the Decatur (Ill.) plant of Malleable Iron Co., employing about 100 men, and the Allith-Prouty Co. plant, Danville, Ill., in Decatur has been announced and transfer of machinery and equipment is under way. It is expected that production of the new unit at Danville will begin about Mar. 1 at about 75 per cent capacity. C. L. LIEBAU, secretary and treasurer of Allith-Prouty, and J. O. KLEIN, superintendent of Decatur, have already moved to Danville.

Locomobile Co. of America, Bridgeport, Conn., has been purchased by a bondholders' committee for $200,000. Foreclosure proceedings by First Na-

tional Bank & Trust Co. caused absolute sale, and bondholders bid to protect their own holdings. The committee is composed of FRED D. COREY, Buffalo; W. H. STRONG, WILLIAM R. PARKS and H. HERBERMANN, New York.

Rockford Northwestern Malleable Corp. and Gunite Corp., Rockford, Ill., have consolidated as Gunite Foundries Corp., with DUNCAN P. FORBES as president and general manager. He was formerly president of both. The company will manufacture brake drums, clutch pressure plates, connecting rods, wrenches and bolts.

Decision to concentrate more of its manufacturing activities in La Porte, Ind., has been announced by GEN. OTTO H. FALK, president of Allis-Chalmers Mfg. Co., Milwaukee. The announcement was made in connection with the acquisition of Birdsell Co., a farm implement company of South Bend, which will be moved to La Porte.

Harnischfeger Corp., Milwaukee, has acquired the arc-welding and electric motor lines of Northwestern Manufacturing Co. and will manufacture the products at its own National Ave. plant. K. L. HANSEN, inventor of the welders, will join Harnischfeger in a consulting capacity.

Machinery and manufacturing equipment of Manchester Mfg. Co., plastic product manufacturer of Manchester Center, Vt., will be sold at public auction Tuesday, Feb. 16, by Industrial Plants Corp., 25 Church St., New York.

### New Plants

C. L. JOBB of Montreal, president of Pressure Pipe Co. of Canada Ltd. has announced that his company had practically completed arrangements for establishment of a $75,000 plant in Vancouver, B. C. This company at present holds the contract for the manufacture and supply of all pipe to be used in the First Narrows tunnel.

General Controls Co., Ltd., has established factory and office headquarters at 1539 Folsom St., San Francisco, Calif. The company manufactures automatic controls, and W. A. RAY is manager.

### Orders

British aircraft manufacturers have secured aircraft orders from the Belgian Government amounting to more than $1,500,000 for "Firefly" and "Fox" airplanes.

Lavelle Foundry, Anderson, Ind., closed for several weeks as the result of receivership proceedings, is to resume operation under the receiver. Sufficient orders are on hand to employ a complete force. The company owns three foundries, two in Anderson and one in Indianapolis.

Electric Boat Co., New London, Conn., is employing 450 men in construction of the new U. S. submarine "Cuttlefish." This number will be increased to 750 by June, it is expected, since other submarine construction for foreign countries is under consideration.

Hamilton Standard Propeller Co., East Hartford, Conn., is building a one-story addition, 24x24 ft., with a machine foundation to support testing machinery.

Lackawanna Railroad last week ordered 4,000 tons of rails, and the Katy Lines ordered 2,800 tons.

Guiberson Corp., South Dallas, Texas, following recent successful flying tests of a Diesel motor is soon to begin construction of it. Manufacture of oil well specialties will also be continued at the plant.

### Agents and Branches

Motch & Merryweather Machinery Co., 1315 Clark Bldg., Liberty at Wood St., Pittsburgh, has been appointed exclusive sales representative for "Milwaukee" milling machines in the Pittsburgh and Western Pennsylvania territory, also including West Virginia and Eastern Ohio. Kearney & Trecker Corp. will, however, continue to maintain in Pittsburgh its direct factory sales and service man, E. F. SCHROEDER. Motch & Merryweather is located at 1315 Clark Bldg., Liberty at Wood Sts., Pittsburgh.

Marshall & Huschart Machinery Co., 571 Washington Blvd., Chicago, has announced resident salesmen in the following territories: FRED A. BENNETT, connected with the company for the past seven years, will reside in South Bend, Ind., to cover the Indiana territory and the Michigan territory. H. D. GENTRY, with the company for the past six years, will reside in Moline, Ill. and cover the Iowa territory and a portion of the Southern Illinois territory.

Studebaker Chemical Co. has sold its entire output of rust-proof coatings, marketed under the trade name of "Rust-oy," to the Medusa Portland Cement Co. for national distribution. Medusa will sell the product through its various dealers, and Studebaker will manufacture the vehicle portion of Medusa's cement floor coating. The company will remain at Elyria, Ohio, and J. M. WILLIAMS continues as president.

The Cleveland office of Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, is being moved from the Union Trust Bldg., to 1740 E. 12th St. HAYDEN F. WHITE remains manager.

C. F. Burgess Laboratories, Inc., 202 E. 44th St., New York City, has taken over the activities of Burgess Battery Co. in the sale of Burgess Radiovisor Bridges, vacuum contacts, vacuum contact relays, and other electronic devices, as well as the acoustimeter line of Burgess-Parr Co.

Manufacturers of the Great Western stoker have opened offices at 886 Massachusetts Ave., Indianapolis, for an Indiana sales organization. The stoker is manufactured in Indianapolis.

Maintenance Co., Inc., 449-53 W. 42d St., New York City, has been appointed sole distributor for the New York Metropolitan area of all Autostart asbestos-protected ball-bearing equipment of U. S. Electrical Mfg. Co., Los Angeles, Calif.

Davis Boring Tool Co., St. Louis, Mo., has appointed National Sales Engineering Corp., 404 Lexington Bldg., Detroit, Mich., representative for the Michigan territory.

Crane-Schiefer-Owens, Inc. has been appointed exclusive representative for the Buffalo, Rochester and Syracuse (N. Y.) territory of Baker Bros., Inc., Toledo, Ohio. Crane-Schiefer-Owens has chief offices in Buffalo and offices in Rochester and Syracuse.

## • PERSONALS •

FRED M. GILLIES, assistant general superintendent of the Indiana Harbor plant, Inland Steel Co., was seriously injured in the airplane crash in Chicago which claimed the life of EDDIE STINSON, dean of American fliers.

ROBERT E. MASTERS, industrial manager, consulting mechanical engineer and writer, celebrated his 83rd birthday anniversary Dec. 25, 1931. He was for many years manager of several large manufacturing plants, successful producer 50 years ago of the first cast-steel casting from a cupola, the man who changed the old type of Washburn car wheels to the present type in 1887, and contributor of a variety of articles on foundry subjects to *American Machinist*.

### Executive

DR. J. G. DAVIDSON, formerly senior fellow on the research staff, Mellon Institute of Industrial Research, Pittsburgh, and more recently general sales manager of Carbide & Carbon Chemicals Corp., 30 E. 42d St., New York, N. Y., has been elected vice-president of the company.

M. J. HELSER, long identified with machine shop business in Portland, Ore., has purchased an interest in Robert McIntosh Engine & Machine Works, 14th and Raleigh St., in that city, specializing in marine work. Mr. Helser owned a machine shop in Portland from 1907 to 1927.

T. FRANK JOYCE, assistant vice-president of Boston & Maine Railroad Co., Boston, Mass., has resigned and plans an extended vacation before announcing future business plans.

L. J. KANITZ, general sales manager and WALLACE SWEINER, comptroller, Continental Motors Corp., Detroit, Mich., were named directors at the annual meeting, when the board of directors was increased from eight to nine members. ROBERT INSLEY, vice-president and manager of Continental Aircraft Engine Co., retiring director, will henceforth devote his time to management of the aircraft division.

D. M. SACHS has been elected president of National Transit Pump & Machine Co., Oil City, Pa. Other officers are G. BROCHNER, vice-president; L. C. LONGNAKER, vice-president and treasurer, and F. C. ZIMMERMAN, secretary.

F. W. STEERE, formerly president of Steere Engineering Co., Detroit, Mich., has opened an office in the Bar Bldg., White Plains, N. Y., under the name of F. W. Steere Co., incorporated in Michigan, and is to take out a license from Autogiro Co. of America for the manufacture of "windmill" planes under the De Cierva patents. The plant probably will be in Detroit. HERACLIO ALFARA will be in charge of design and engineering.

### Operating

HARRY BURKHARDT has resigned as foundry superintendent of Marshall (Mich.) Furnace Co.

PAUL CROUSE, assistant manager of Ames, Baldwin, Wyoming Shovel Co. plant, Anderson, Ind., has been transferred to North Easton, Mass. E. T. NIPHER, former manager of the Anderson plant, now stationed at Parkersburg, W. Va., is expected to return to Anderson.

DONALD L. MCCUBBIN, assistant manager, has been appointed manager of the Cincinnati plant, Joseph T. Ryerson & Son, Inc., effective Feb. 1. Mr. McCubbin comes to this position after nine years at the Ryerson Chicago plant and more than seven years with the Cincinnati plant. LEWIS E. SKINNER returns to the Chicago sales organization to take over a special sales department.

W. S. PRITCHARD has become a development engineer for Doehler Die Casting Co., Toledo, Ohio.

### Sales

J. F. MEHLHOPE, formerly Chicago district sales manager for Central Alloy Steel Corp. and later for Newton Steel Co., has joined the sales force of Chicago Steel Service Co., warehouse distributors for Toncan Iron and Enduro Stainless Steels, products of Republic Steel Corp.

C. L. MCMULLEN, former manufacturer and seller of farm and industrial internal combustion engines, has joined the Special Sales Division, Caterpillar Tractor Co. as manager of engine sales.

### Activities

F. C. ERHEARDT of South Bend (Ind.) Lathe Works; W. H. DONNELL, of Godfrey Conveyor Corp., Elkhart, and A. R. FERRIS of Domore Chair Mfg. Co., Elkhart, have been named members of the board of directors of Indiana Industrial Association, Inc., which has for its purpose stimulation of buying of Indiana-made products.

E. KENT HUBBARD, Middletown, Conn., president of Manufacturers' Association of Connecticut, has accepted a state membership in the New England Council to succeed CHARLES H. UPSON of Naugatuck, resigned.

ALGOT J. E. LARSON has been elected president of Manufacturers Association of Jamestown, N. Y., succeeding NATHAN M. WILLSON, who retires after two years in that capacity. FRANK G. GARRETT was re-elected first vice-president, WILLIAM R. REYNOLDS, JR., second vice-president, and C. F. AMERSON, third vice-president.

FRANK B. LOUNSBERRY, vice-president of Ludlum Steel Co., has been elected president of the Dunkirk (N. Y) Chamber of Commerce.

## • OBITUARIES •

WALTER S. COMLY, 69, general sales manager and assistant treasurer of Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., died there Jan. 18. He had been ill for a year, after suffering a paralytic stroke, but had previously been connected with the company and its predecessors for about 53 years, having joined it as a toolmaker in 1878. His father, SAMUEL, was then general sales manager.

GEORGE DOYLE, 71, senior member of Doyle & Devereaux, machine shop operators, Syracuse, N. Y., until his retirement about five years ago, died recently there, following a five-year illness.

FREDERICK G. ERBE, 49, secretary of Yawman & Erbe Mfg. Co., Rochester, N. Y., died of pneumonia Feb. 5 after a week's illness. His father GUSTAVE ERBE, Sr., one of the company founders, died in October.

ENGELHARDT W. HOLST, consulting engineer and head of his own firm in Boston, died at his home in Mt. Vernon, N. H., Feb. 1, after a long illness, of angina pectoris. Born in Norway, he came to this country as a youth and received his early training with General Electric. Before he branched out for himself he was for many years engaged in electric railway engineering.

EMERSON K. LEWIS, 57, formerly vice-president of Lewis Foundry & Machine Co., Groveton, Pa., founded by his father, died at his home in Coraopolis, Pa., Jan. 25. For the past ten years he had been associated with the Duquesne Foundry Co., Pittsburgh, in its roll sales department.

T. WALTER MARTIN, manufacturer of steel forgings, died in Brooklyn, N. Y., after an illness of 10 days.

ROBERT C. MONTEAGLE, 72, retired mechanical engineer, died at his home in Burlingame, Calif., Jan. 20. A native of Scotland, during the war Mr. Monteagle owned and operated a plant handling heavy forge work in Seattle, Wash. He retired from active service several years ago.

HARRY NORVIEL, 44, engineer for Delco-Remy Corp., a subsidiary of General Motors, died in Anderson, Ind., recently following an appendectomy.

FREDERICK J. TOWNSEND, 83, wire manufacturer of Painted Post, N. Y., died Jan. 24 there.

## • MEETINGS •

**AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS**
Annual meeting, Engineering Societies Bldg., New York, Feb. 15-19. Headquarters there.

**AMERICAN MANAGEMENT ASSOCIATION**
Packaging, packing and shipping exposition, Palmer House, Chicago, Ill., Mar. 7-12, 1932. W. J. Donald, managing director, Room 602, 225 West 64th St., New York, N. Y.

**AMERICAN WELDING SOCIETY**
Annual meeting, Engineering Societies Bldg., New York, Apr. 27-29. William T. Spraragen, secretary, 29 W. 39th St., New York City.

**FOUNDRY AND INDUSTRIAL EXPOSITION**
Also 36th annual convention, American Foundrymen's Ass'n, Philadelphia Municipal Auditorium, May 2-6. C. E. Hoyt, manager, American Foundrymen's Ass'n., Inc., 222 W. Adams St., Chicago.

**AMERICAN SOCIETY FOR TESTING MATERIALS**
Annual meeting, Atlantic City, June 20-24. R. E. Hess, assistant secretary, 1315 Spruce St., Philadelphia, Pa.

**NATIONAL MACHINE TOOL BUILDER'S ASS'N**
Third National Machine Tool Show. Cleveland (Ohio) Municipal Auditorium, Sept. 10-17. Boyd Fisher, general manager, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio.

# MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

## Opportunities for Future Business

**Conn., Greenwich**—Charles F. McKeever, 31 West Putnam Ave., completed plans for a 2 story, 50 x 100 ft. addition to automobile service station. Estimated cost $40,000. Fletcher-Thompson, Inc., 1336 Fairfield Ave., Bridgeport, Archt.

**Fla., Palm Beach**—Goodyear Tire & Rubber Co., 1144 East Market St., Akron, O., awarded contract for construction of a 1 story, 76 x 112 ft. service station at Fourth and Poinsettia Sts. here. $21,000.

**Ga., Atlanta**—City, c/o C. E. Kauffman, Engr., City Hall, having preliminary plans prepared for erection of a 2 story garage building at Hunter and King Sts. S. E.

**Idaho, Moscow** — Bellboy Gold Mining Co., having preliminary plans prepared for construction of a 200 ton flotation mill. M. J. Savage, Kellogg, President.

**Ill., Chicago**—Firestone Tire & Rubber Co., H. A. Platt, in charge, 1920 South Michigan Ave., will receive bids about February 15 for a 1 story, 100 x 175 ft. service station at 4440 West Madison St. Private plans.

**Ind., Lafayette**—Purdue University will receive bids until March 20 for construction of a 3 story, 60 x 230 ft. mechanical engineering building on campus. Estimated cost $200,000. Walter Scholer, 210 Wallace Bldg., Archt. Noted January 14.

**Ia., Muscatine**—Frank Maurath, 503 East Front St., will build a 1 story, 40 x 50 ft. tire repair shop. Ernies Tire Shop, 121 East Front St., lessee.

**La., Harvey**—Favrot & Livaudais, Hibernia Bldg., New Orleans, Archts., will receive bids until February 16 for construction of a 3 story can manufacturing plant including equipment, etc., for Continental Can Co., 1 Pershing Sq., New York, N. Y. Estimated cost $125,000. Noted January 28.

**Mass., Fall River**—B. M. Durfee Co., 80 North St., having plans prepared for construction of a service station at Bedford and Rock Sts. Estimated cost $40,000. Private plans. Goodyear Tire & Rubber Co., 1144 East Market St., Akron, O., lessee.

**Minn., Brainerd**—Ivar Gustafson, awarded contract for construction of a 1 story machine shop on Fourth St.

**Minn., Minneapolis** — General Electric Co., River Road, Schenectady, N. Y., acquired a site near Washington Ave. between 12th and 13th Ave. S. here for erection of a large plant for the manufacture of electrical apparatus. Estimated cost $500,000. E. M. Pinkerton, 124 Valley View Pl., Minneapolis, is northwest manager.

**N. J., Bloomfield**—General Electric Co., M. Chapman, in charge, 5 Laurence St., completed revised preliminary plans for a 1 story addition to factory. Estimated cost $40,000. Private plans. Noted November 19.

**N. J., Edgewater**—National Sugar Refining Co. of New Jersey, River Road, receiving bids for construction of a 1 story garage. Estimated cost $150,000. Private plans.

**N. J., Jersey City**—J. Goldenberg, 80 Woodland Ave., Englewood, having revised preliminary plans prepared for construction of a 4 story, 90 x 150 ft. garage and showrooms at Sip and Summit Aves. Estimated cost $150,000. Charles Shilowitz, 26 Journal Sq., Jersey City, Archt. Noted May 7.

**N. J., Somerville**—P. C. Van Nuys, 1 West Main St., Archt., will receive bids about March 10 for construction of a 2 story, 100 x 200 ft. garage and stores building for Owner, c/o Archt. Estimated cost $150,000. Noted December 10.

**N. Y., Brooklyn**—I. J. Blaukopf, Bayard St., manufacturers of kalamine doors, plans a 1 story addition to sheet metal shop at Bayard St. and Manhattn Ave. W. J. Minogue, 1715 Nelson Ave., Bronx, Archt.

**N. Y., Brooklyn**—Maxweld Corp., 140 13th St., having sketches made for a 1 story addition to plant at 13th St. and East Second Ave. Estimated cost $40,000. Scott & Prescott, 34 East 23rd St., New York, Archts.

**N. Y., Brooklyn**—S. F. Oppenheim Inc., 26 Court St., having sketches made for a 1 story, 95 x 150 ft. service garage at Hegeman Ave., Malt St. and Louisiana Ave. Estimated cost $40,000. B. Greenberg, 4902 Foster Ave., Archt.

**N. Y., Brooklyn**—G. G. and W. F. Pengel, 600 Coney Island Ave., plans addition to shop and garage. Seelig & Finkelstein, 153 Pierrepont Ave., Archts. Maturity June or later. Delayed pending grant of building permit. Noted January 28.

**N. Y., Glendale** — Cypress Homes Co., 582 Jamaica Ave., Brooklyn, will build a service garage at Rockaway Blvd. and West 75th St. here. J. Baker, 9 Jackson Ave., Long Island City, Archt. Work will be done by separate contracts. Maturity indefinite.

**N. Y., Laurelton**—John Mirro, 224-05 Sheffield Ave., Long Island City, preparing plans for a 1 story, 25 x 84 ft. repair shop at Westminster Blvd. and 224th St. J. Cahill, 155-28 Jamaica Ave., Jamaica, Archt.

**N. Y., Long Island City**—Sara Bloom, 544 Hegeman Ave., Brooklyn, plans construction of a 1 story, 30 x 64 ft. repair shop, etc., at Conduit and Lansing Aves. D. Levinson, 163-18 Jamaica Ave., Jamaica, Archt.

**N. Y., New York**—Max S. Rosenfeld, 56 East 115th St., plans construction of garage, storage building, etc. Estimated cost $50,000. Sam Roth, 1182 Broadway, Archt.

**N. Y., New York**—Prospect Marble Works, 1100 Stebbins Ave., having plans prepared for construction of a 1 story, 25 x 30 ft. shop at Stebbins Ave. and 167th St.

**N. Y., New York**—S. Roth, 1182 Broadway, Archt., will receive bids until February 15 from selected list of bidders for alterations to service garage for M. S. and R. Rosenfeld, 56 East 115th St. Estimated cost $50,000.

**N. D., Fargo**—White Eagle Oil Co., E. A. Rundquist, Division Manager, having plans prepared for a 1 story, 47 x 102 ft. warehouse including 16 x 31 ft. repair shop at First St. and First Ave. N. Estimated cost $40,000.

**N. D., Fargo**—W. L. Hagart, 101 Eighth St. S., awarded contract for construction of a 1 story, 35x35 ft. tire service shop.

**N. D., Grand Forks**—Red River Valley Power Co., subsidiary of Northern States Power Co., receiving bids for construction of a 1 story, 22 x 50 ft. machine shop and filter house, 1 story, 14 x 66 ft. switch gallery and cable vault at power plant. Dick Keeley in charge of construction.

**N. D., Williston**—State Highway Commission, H. C. Frahm, Ch. Engr., Bismarck, plans construction of a part 1 and part 2 story building including machine shop. Estimated cost $201,000.

**Pa., Ambridge**—H. H. Robertson Co., Grand Bldg., Pittsburgh, have asked Ambridge Council to vacate three streets to enable them to construct 150 x 600 ft. steel floor plant here. Private plans.

**S. C., Denmark**—Voorhees Normal & Industrial School, will soon award contract for construction of a 2 story, 32 x 86 ft. school building. S. J. Makielski, Charlottesville, Va., Archt.

**Tex., Austin**—Board of Regents, University of Texas, c/o J. W. Calhoun, Comptroller, awarded contract for construction of a group of buildings including engineering building on University campus, to Bellows-McClay Construction Co., Construction Bldg., Dallas. $268,750. Estimated total cost $2,400,000. Noted January 7.

**Wash., Seattle**—Aircraft Plywood Co., 1319 West Nickerson St., plans a 60 x 240 ft. addition to factory.

**Wash., Seattle**—Commercial Boiler Works, 53 West Lander St., plans to rebuild plant destroyed by fire.

**Wis., Eau Claire**—Eau Claire Concrete Co., 501 Main St., plans construction of a 1 story, 40x46 ft. garage on North Dewey St.

**Wis., La Crosse**—City Council, F. L. Kramer, Clk., will build a 1 story municipal garage. Estimated cost $25,000.

**Wis., Park Falls**—Charles Pauser, will build a 1 story, 50 x 100 ft. blacksmith shop.

**B. C., Vancouver** — Pressure Pipe Co. of Canada Ltd., C. L. Jobb, 1321 Sherbrooke St. W., Montreal, Pres., completed arrangements for establishment of a plant here. Estimated cost $75,000.

**United Socialist Soviet Russia**—Soviet Government, c/o Amtorg Trading Corp., 261 5th Ave., New York, N. Y., will build a typewriter manufacturing plant at Ligovo near Leningrad. Work by day labor and technical aid contracts. Also additional units to plant for the manufacture of transmission gears, shafts and ball bearings at Samara on Volga River by technical aid contracts.

## Equipment Wanted

**Calif., Mare Island** (sta. Vallejo)—Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until February 23 for tool grinder, vertical drill, turret lathes and combination angling, mitering, beveling and dadoing saw, all motor driven for Navy Yard here. Schs. 7404, 7422, 7398, 7406 and 7421.

**Conn., Hartford**—State Highway Department, 165 Capital Ave.—will receive bids until February 18 for small tools.

**Ill., Springfield**—Department of Purchases & Construction, Division of Purchases & Supplies, Capitol Bldg., A. Wayne Daily, Purch. Agt.—will receive bids from February 2 to February 25 for tools, industrial and workshop materials, roadbuilding and maintenance equipment, machinery, etc.

**Minn., Minneapolis**—Philip S. Van Wyck, 221 Penn Ave. S.—acetylene welding torch, blow torch, set of S.A.E. stock and dies ¼ to ½ in., portable electric drill ½ in.

**Mo., St. Louis** — Duro Bilt Seat Co., 1935 Washington Ave.—20 to 24 in. metal grinder, single disc.

**Mo., St. Louis**—U. S. Engineer Office, War Department—will receive bids until February 23 for electric arc welding set complete with all accessories.

**N. Y., Brooklyn**—Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until February 16 for one 35 ton hydraulic press, one motor driven gap splitting and squaring shearing machine, also gasoline engine driven air welding outfit for Navy Yard here. Schs. 7388, 7397 and 7419.

**Va., Norfolk** — Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until February 23 for 40 in. woodworking angle band saw for Navy Yard here. Sch. 7423.

**Wash., Puget Sound**—Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until February 23 for four motor driven turret lathes for Navy Yard here. Sch. 7405.